PB85-116333

AQUIRE: Aquatic Information Retrieval Toxicity Data Base: Project Description Guidelines, and Procedures

Montana State Univ., Bozeman

Prepared for

Environmental Research Lab. -Duluth, MN

Jun 84

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Environmental Research
Laboratory
Duluth MN 55804

EPA-600/8-84-021
June 1984

PB85-116333

Research and Development

EPA

AQUIRE: Aquatic Information Retrieval Toxicity Data Base

Project Description, Guidelines, and Procedures

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.
EPA-600/8-84-021

2.

3. RECIPIENT'S ACCESSION NO.
PB85-116333

4. TITLE AND SUBTITLE
AQUIRE: Aquatic Information Retrieval Toxicity Data Base--Project Description, Guidelines, and Procedures

5. REPORT DATE
June 1984

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
R. C. Russo, and A. Pilli

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
U.S. Environmental Protection Agency
Environmental Research Laboratory-Duluth
6201 Congdon Boulevard
Duluth, Minnesota 55804

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.
CR807240

12. SPONSORING AGENCY NAME AND ADDRESS
Environmental Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Duluth, Minnesota 55804

13. TYPE OF REPORT AND PERIOD COVERED

14. SPONSORING AGENCY CODE
EPA-600/03

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This manual provides guidelines for the AQUIRE data base and procedures for encoding data from published scientific papers on aquatic toxicity. These complete instructions are intended primarily for those entering data into AQUIRE, to insure uniformity of data interpretation and entry. The manual will also be used for AQUIRE users, to insure proper understanding of the encoded data.

The basic guidelines and procedures in this manual were initially established in June 1981 for the AQUIRE data base. They have undergone numerous additions and refinements to accommodate information encountered while reviewing papers as the data base developed and expanded.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group

18. DISTRIBUTION STATEMENT
Release to public

19. SECURITY CLASS (This Report)
unclassified

20. SECURITY CLASS (This page)
unclassified

21. NO. OF PAGES
~~195~~ 186

22. PRICE

EPA-600/8-84-021
June 1984

AQUIRE: AQUATIC INFORMATION RETRIEVAL TOXICITY DATA BASE
Project Description, Guidelines, and Procedures

by

Rosemarie C. Russo
Environmental Research Laboratory
U.S. Environmental Protection Agency
Duluth, MN 55804

and

Anne Pilli
Fisheries Bioassay Laboratory
Montana State University
Bozeman, MT 59717

CR807240

ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
DULUTH, MN 55804

NOTICE

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

PREFACE AND ACKNOWLEDGMENT

This manual provides guidelines for the AQUIRE data base and procedures for encoding data from published scientific papers on aquatic toxicity. These complete instructions are intended primarily for those entering data into AQUIRE, to insure uniformity of data interpretation and entry. The manual will also be useful for AQUIRE users, to insure proper understanding of the encoded data.

The basic guidelines and procedures in this manual were initially established in June 1981 for the AQUIRE data base. They have undergone numerous additions and refinements to accommodate information encountered while reviewing papers as the data base developed and expanded.

Many individuals participated in the reviewing and encoding of toxicity data. Their contributions to the development of the data base are acknowledged here: Cheryl Anderson, Sheila Arimond, Mary Balcer, Christine Caravoulias, Charles Chakoumakos, Carolanne Curtis, Daniel Hanson, Theodore Junghans, Ann Lima, Carl Mach, Vincent Mattson, Joseph Richter, Barbara Sheedy, and Pamela Shubat. The algae, field study, BCF residue, and procedures for the sediment, ammonia and chlorine were developed and the associated papers were reviewed by Carl Mach, Mary Balcer, Barbara Sheedy, and Ann Lima, respectively. Organism name verification and documentation was coordinated by Mary Balcer with the assistance of Donna Statzell, Carolanne Curtis, and Cay Heimbach.

Lois Blaine designed and implemented the literature and CAS number search schemes. Christine Caravoulias and Donna Statzell established and maintained the reference collection and bibliography. Cheryl Anderson and Theodore Junghans were responsible for verification,

documentation and assigning CAS numbers used in the data base. Charles Auer provided many valuable suggestions during the course of this work.

AQUIRE computer programs were developed by Bradley Greenwood, Stephen Lozano, and Paula Pollock with assistance from Dawn Chaffee and Sheila Leppala. We thank Dawn Chaffee, Shelley Heintz, Donna Statzell and Judy Veith for entering and proofing tens of thousands of data entries. Cheryl Anderson was invaluable in maintaining quality assurance and uniformity of the data entries. Support of technical assistance searches, author correspondence and accessory data files was coordinated by Donna Statzell with assistance from Daria Carle, Diane Ericson, Alessandria Giuliani, Mary Harden, Shelley Heintz, Terry Highland, and Judy Rudman.

Rosemarie C. Russo
Anne Pilli

May 1984

TABLE OF CONTENTS

Page

Description 1

General Guidelines 3

    Organisms Included 3
    Acquiring Papers 3
    Archiving Papers 3
    Categories of Papers 3
    Papers in Foreign Languages 4
    Acute Test Papers 4
    Sublethal Effects Papers. 4
    BCF/Residue Papers 5
    Field Study Papers 5
    Algae Papers 5
    Sediment Papers 5
    Toxicity Papers Not Included 6
        Oils 6
        Complex Effluents 6
        Mixtures 6
        Joint Toxicity 6
    Papers with Redundant Information 7
    Proofreading 7
    Quality Assurance 7
    Chemical Abstracts Services (CAS) Registry Numbers 8
    Species Names and Numbers 8

Standard AQUIRE Procedures for Completing Data Coding Forms . . . 9

    General Information 9
    Chemical Name 10
    Chemical Abstracts Services (CAS) Registry Number 10
    Reference Number 10
    Reviewer 10
    Date 10
    Freshwater - Saltwater 10
    Lab-Field 11
    Purity/Grade 11
    Test Organism 12
    Controls 12
    Effect Endpoint (LC50 or EC50 only) 14
    Effect 16
    Concentration 18
    Bioconcentration Factor (BCF)/Residue 19
        General Procedure 19
        Specific Information 20
        Use of Residues (RSD) 23

TABLE OF CONTENTS, continued

Page

Exposure Time 24
Life Stage 24
Exposure Type 25
Concentration 25
Temperature 25
Hardness and Alkalinity 26
Dissolved Oxygen 26
pH 26
Review Code 27
Author Correspondence 29
Other Chemicals 29
Other Water Chemistry Available 29
Other Effects 30
Remarks 30
Notes on Reviewing Algae Papers 32
    Controls 32
    Effects 34
    Remarks 36
    References 36
    Methods Papers 36
Notes on Reviewing Field Papers 38
    General Description of Experiment 38
    Controls 39
    Concentration 40
    Exposure Type 40
    General Comments 41
Notes on Reviewing Sediment Papers 42
Notes on Reviewing Ammonia Papers 44
Notes on Reviewing Chlorine Papers 46

Attachments

A. Reference Search Documentation A-1
B. Reference Format (RETOX) B-1
C. CAS Number Verification and Assignment Procedure . C-1
D. SPECTAR: Species Tally and Record D-1
E. Major/Minor Species Categories E-1
F. RESPEC: References for Species F-1
G. Sample Data Coding Form G-1
H. Grade/Purity Abbreviations H-1
I. Effect Endpoint Abbreviations I-1
J. Effect Abbreviations J-1
K. Concentration Calculations K-1
L. Conversion Factors L-1
M. List of Atomic Weights M-1
N. Concentration Codes N-1
O. Exposure Type Abbreviations O-1
P. Quality Review Code Considerations for Laboratory Tests P-1
Q. Standard Abbreviations for Use in Remarks Q-1
R. Significant Figure Conventions R-1

DESCRIPTION

The AQUIRE -- Aquatic Information Retrieval -- data base was established to provide a comprehensive, systematic, computerized compilation of aquatic toxicity data.

Scientific papers published world-wide on toxicity of chemicals to aquatic animals and plants are collected and reviewed for AQUIRE. Emphasis has been on papers published between 1972-1981. Only data from primary references are included. Selected results and related information from aquatic toxicity tests are extracted, encoded, and added to the data base; acute, sublethal and bioaccumulation effects are entered. Tests with freshwater and saltwater plants and animals (except bacteria, birds, adult amphibians and mammals) are included, for any individual chemical. Toxicity tests on complex effluents, oils, or combined pollutants, are not included. A unique characteristic of AQUIRE is the incorporation of a data quality review code. Depending on the methodology documentation and caliber of test methods, encoded data from tests are assigned a quality rating for reliability of results.

Published toxicity data are acquired by literature searches, review article bibliographical listings, criteria document bibliographies, and from already-existing toxicity reprint collections. Data extracted from the literature are coded onto data coding forms and keypunched into a Direct Access Storage Device. Software programs have been developed to insure accurate and rapid transfer of information from the data coding forms to permanent computer data files. Data stored in computer files can be easily retrieved and outputted onto video terminals, line printers or magnetic tapes.

The AQUIRE data base is currently stored on the PDP 11/70 computer at the U.S. Environmental Protection Agency, Environmental Research Laboratory-Duluth (ERL-D). The data base will ultimately be available to users through the SPHERE multi-data base system being developed by the Office of Toxic Substances (OTS), U.S. Environmental Protection Agency, Washington, D.C. Information can be retrieved from AQUIRE by means of retrieval programs that search and sort the data base by chemical, species tested, and duration of experiment. Complete files of papers whose data are included in AQUIRE are maintained at ERL-D and OTS-Washington. Computerized listings of bibliographic citations are an integral part of the data base.

GENERAL GUIDELINES

1. Organisms Included

   Papers reporting toxicity tests with freshwater and marine animals (except bacteria and mammals) and plants are reviewed. Amphibian data for purely aquatic life stages of the organisms are reviewed; tests conducted with adult amphibians out of the water and adult amphibians *in vitro* are not reviewed.

2. Acquiring Papers

   Relevant literature is retrieved through on-line data base searches of the world literature. A search was designed to include the effect of virtually any toxic substance on any plant or aquatic organism (except bacteria, birds, adult amphibians, and mammals). The procedure for acquisition is described in Attachment A.

3. Archiving Papers

   All papers reviewed are assigned a numerical code, and hard copies are filed in numerical order at ERL-D. Hard and microfiche copies of all papers are also on file at and available from EPA-OTS. The format for citation of references is described in Attachment B. A computerized file (RETOX) of bibliographic reference citations is stored at ERL-D and EPA-OTS.

4. Categories of Papers

   All papers added to the reference file are assigned a code letter categorizing the paper. An A is assigned to all papers that are used in AQUIRE. All other papers are assigned to one of the categories listed in Attachment B.

5. Papers in Foreign Languages

Foreign papers are obtained and divided into two categories depending on information obtained from review of the paper or its abstract:

(1) Data are encoded for papers containing toxicity information in the paper or its abstract. The paper is given a review code of 4, indicating insufficient information is available for assignment of a data quality rating. If available information warrants, complete English translations are obtained, and the data are re-encoded. The review code is changed to reflect the complete review.

(2) For papers that do not have any toxicity information translated or that have no useful toxicity information, the paper is categorized as one that is not considered to warrant full translation. These papers are categorized as unused foreign papers and filed at ERL-D.

6. Acute Test Papers

An acute test is a short-term bioassay used to determine the concentration of a toxicant that produces a specific adverse effect on a specified percentage of test organisms in a specified time.

7. Sublethal Effects Papers

Toxicity tests, other than tests with LC50 or EC50 endpoints may fall into the sublethal effects category. Chronic, partial chronic, metabolism, and *in vitro* toxicity tests are included in this category.

8. BCF/Residue Papers

BCF/residue tests are those for which bioconcentration factors (BCF), and/or chemical accumulation, uptake or residue information is reported.

9. Field Study Papers

A field test is defined as an experiment in which organisms are exposed in a natural water body, or in an artificial water body that meets all of the following criteria:

1) It is located outdoors;
2) The system has a natural bottom substrate even though it may be underlined with an artificial substrate; and
3) The system has been established long enough to allow aquatic communities (e.g., bacteria, phytoplankton, zooplankton) to become established.

All other experiments are considered lab tests (e.g., ponds with plastic liners and no natural substrate, algae suspended within closed glass bottles in a lake).

To review a field test follow the Standard AQUIRE Procedures with the additions outlined on pages 36-39.

10. Algae Papers

An algae test is a bioassay conducted with an organism from one of the eight divisions of algae including the blue-green algae. To review algae papers follow the Standard AQUIRE Procedures with the additions outlined on pages 30-35.

11. Sediment Papers

Toxicity tests in which sediment is used as the toxicant carrier or in which a chemical is added to a test container containing sediment are reviewed following the Standard AQUIRE Procedures with the additions outlined on pages 40-41.

12. Toxicity Papers Not Included

Oils - Papers with toxicity information on oils (i.e., complex petroleum-based mixtures) are not reviewed. If the author has identified and tested specific chemical components of an oil, then that portion of the paper is reviewed. It is noted in Other Effects that oils were also tested.

Complex Effluents - If the author has identified and tested specific chemical components of the effluent, then that portion of the paper is reviewed. It is noted in Other Effects that complex effluents were also tested. Papers dealing exclusively with the aquatic toxicity of complex effluents are incorporated into the Complex Effluents Toxicity Information System (CETIS) at ERL-D.

Mixtures - Papers containing toxicity information on a chemical tested both by itself and in combination with other chemicals are reviewed. Only the toxicity data for the chemical tested alone is encoded; however, the formulae of the other chemicals in the combination tests are recorded in the Other Chemicals section of the data coding form. Papers dealing exclusively with the toxicity of mixtures of chemicals are not reviewed.

Joint Toxicity - Papers containing both single chemical toxicity information and toxicity information on a single chemical that in aqueous solution dissociates into two or more chemical species (e.g., NH_4F), two or more of which are themselves toxic, are reviewed. The jointly toxic chemical is noted in Other Effects. Attachment K gives a list of chemicals that are not included in

AQUIRE. If complexing agents; e.g., EDTA or humic acid, are used in conjunction with a toxicant, that test is not included in AQUIRE. It is noted in Other Effects.

13. Papers With Redundant Information

If an author publishes information in a dissertation, symposium proceedings or book, and also publishes that same information in a journal, only the journal publication is reviewed; the former three publication types are not reviewed. If only portions of the data are published in a journal article, both the original document and the journal article are reviewed; the original document is reviewed only for the data unique to it.

14. Proofreading

After keypunching of data from the data compilation form, all data entries are independently proofread from the computer printout by two ERL-D AQUIRE staff members. Corrections are made by the keypuncher, then these corrections are also proofed from the printout by two staff members.

15. Quality Assurance

Ten percent of the publications entered are doubly reviewed; i.e., independently reviewed by two different reviewers. The AQUIRE Coordinator compares both reviewers' data coding forms, documents the differences (if any) between reviewers, archives the documentation and discusses the differences with reviewers. Errors, if any, are identified and corrected. Discrepancies due to differences in interpretation are resolved by the data base coordinator. Successive errors incurred by an individual reviewer are dealt with by retraining, or termination if warranted.

16. Chemical Abstracts Services (CAS) Registry Number

A CAS number is assigned to each chemical in the data base. The CAS number is used as one of the links for retrieving information from the data base. The method for assigning CAS numbers is outlined in Attachment C.

17. Species Names and Numbers

Before encoded data are keypunched, arbitrary but unique species code numbers are assigned and recorded on the data coding forms next to the organism name in order to link a species data file (Attachment D) to the AQUIRE toxicity file. Numbers are assigned at ERL-D beginning with the number one. Major and minor classifications (Appendix E) are assigned to each organism in the species data file in order to facilitate sorting and retrieval on a broader level (e.g., class, order, family) than single organism. Each species' Latin and common names are checked in one of the taxonomic references listed in Attachment F to insure use of current, correct standard nomenclature.

STANDARD AQUIRE PROCEDURES FOR COMPLETING DATA CODING FORMS

General Information

The following procedures are designed to supplement a training period required for each reviewer. Any exceptions from the following rules must be authorized by the data base coordinator and subsequently documented in these Procedures.

A sample coding form is found in Attachment G. Each numbered section below refers to a specific section of the data compilation form.

Use a separate form for each chemical and for each reference.

Use a separate line on the form for each test reported in the paper. If many tests run under similar conditions are included in one paper, place ditto marks in the boxes where the information is identical to the line above it.

Report only information which is given in the text or in tables. Graphical information is noted in Other Effects. A paper in which all information is graphed will not be included in the data base.

If information is unavailable, write either NR (not reported) or NA (not applicable) in the appropriate coding space; do not leave any blanks.

If additional information needs to be added for any coding field, add a slash (/) to the entry and in the Remarks field; e.g., for concentration, code as Conc/Remark//. The "Conc" identifies the coding field, the / begins the remark, followed by text and ending with two //'s.

All numbers between 0 and 1 should be reported with a zero preceding the decimal point; e.g., 0.5 not .5.

1. Chemical Name

   If several names for one chemical are given in a paper, select the name most frequently referred to in the paper, record that, and write the other names, or formula if given, in parentheses after it.

2. Chemical Abstracts Services (CAS) Registry Number

   CAS numbers are assigned by ERL-D AQUIRE personnel. The procedure for obtaining CAS numbers is outlined in Attachment C.

3. Reference Number

   The reference number is located in the upper right hand corner of the hard copy of paper. The reference number is the link between the data entered and the original document and can be used for retrieval of both sets of information. On the data coding form enter the reference number followed by the last name of the first author and the year of publication.

4. Reviewer

   Write in last name only.

5. Date

   Write the date on which the paper was reviewed, in the format of month/day/year; e.g., 12/03/84.

6. Freshwater - Saltwater

If the test was conducted in freshwater, reconstituted, or distilled waters, circle FW. If the test was conducted in saltwater, artificial seawater, estuarine, or brackish waters, circle SW. If one paper describes tests conducted in freshwater and saltwater, use a separate data coding form for each. If the test water is not specified, mark an X over the FW/SW coding box and record as NR next to the FW/SW coding box. If a nutrient media (as for algal tests) is used, record as FW or SW, if given, and record the name or type of the media as med/specify type// in Remarks.

7. Lab-Field

Circle LAB if the test was conducted under laboratory conditions. Circle FIELD if the test meets the criteria outlined in Notes on Reviewing Field Papers (pages 36-39). If one paper describes both types of tests, use a separate data coding form for each type. It is considered a lab test if an organism is exposed in the field and then transferred to the lab for further testing. If the paper does not specify LAB or FIELD, mark an X over the LAB/FIELD coding box and record as NR next to the LAB/FIELD coding box.

8. Purity/Grade

Using the author's words, state the chemical grade. Record the percent purity and active ingredient if given. If a radiolabeled chemical is tested, record the isotope if given, otherwise record as radiolabeled. The abbreviations to be used are listed in Attachment H.

9. Test Organism

Record the Latin and/or common species name if given in the paper. If a community of organisms was tested, record in author's words followed by a slash; e.g., Insecta/, and in Remarks give any additional information about inclusive species such as: SPEC/ 7 genera of benthic Diptera, mainly Chironomus//. If a community was exposed but the results are reported individually for each species or family, record each individual name or family under Test Organism, followed by a slash, and in Remarks write SPEC/ tested as a community// or SPEC/ tested as mixed species//. If tests are conducted with individual and mixed species, fill out an entry for each species tested individually. Write "yes" in Other Effects and write in Remarks: 1/also tested mixed species//.

10. Controls

Control mortalities are recorded as S (satisfactory), U (unsatisfactory), or I (indeterminate) according to the following criteria.

- For acute tests, record an S (satisfactory) if $\leq$ 10% of the controls died (or were affected, if EC50 is the endpoint). If the author provides specific information on control mortality or effects, this is recorded as S/ with b/ X % mortality// or b/X % immobilized// written in Remarks. If the control mortality for an acute test exceeds 10 percent, record S for satisfactory if a control mortality correction formula is used or if the authors address the control mortality with a convincing explanation. Either of these is recorded as S/ with b/ X % mortality, adjusted for with correction formula// or b/ X % mortality, author justified// written in Remarks.

- Control mortality in an acute test is unsatisfactory if it exceeds 10% and the authors do not address the mortality or correct for it with a mortality correction formula. This is recorded as U/ and in Remarks write b/ X % mortality//.

- If no information about the controls or their mortality is given, record as I, indeterminate.

- For sublethal effect tests mortality or variation of effect parameter may exceed 10% and still be satisfactory if "natural" mortality or variation in effect parameter is normally high for the life-stage being tested and/or the experiment is conducted for a long time (more than 3 months). The determination of whether it was "natural" mortality or variation, or poor rearing techniques is a subjective decision made by the reviewer. A sublethal control with mortality or variation exceeding 50% should be considered unsatisfactory.

- If a carrier or solvent is used in any test, a separate control should contain the carrier or solvent. If there is a separate carrier or solvent control, record as S/, U/, or I/ as described above, and b/carrier or solvent// written in Remarks. If there is no separate carrier or solvent control, record S/, U/, or I/ based on control mortality and b/ no carrier or solvent control// written in Remarks.

- Additional guidelines to help determine the status of a control include the type (same species, different species) of control organism used, the number of organisms in the control, and the suitability of the control to the type of test treatment. For algal and field papers see the special procedures sections for detailed control information.

- If controls are not used for any or each test, record as U/ and in Remarks write b/no controls//.

11. Effect Endpoint (LC50 or EC50 Only)

- The LC/EC50 endpoint is a statistically derived estimated toxicity test endpoint. It is not the actual concentration at which 50% of the organisms are killed or affected. Record LC50, EC50 or other applicable endpoint; if data are not reported as these quantitative endpoints, record as NA in the effect endpoint column. The reported endpoint is then recorded in the Effect column (see #12).

- An LC50 is the median lethal concentration and should be used only when death is the observed endpoint. TLms and TL50s are considered identical to LC50s. An LD50 endpoint is used when the toxicant is administered as a dose. An EC50 is the median effective concentration and is used when an effect other than death is the observed endpoint; e.g., EC50s are frequently used in *Daphnia* and midge tests when immobility is the endpoint. EC50s will be followed by an abbreviation to define the effect; e.g., EC50IM for EC50 immobilization. The abbreviations are listed in Attachment I.

- If an author uses the term LC50 for an EC50 endpoint, write the correct endpoint term with an asterisk after it. To document this alteration of author's original data, write the exact term used by author on back of form.

- For LT50s, record LT50 in the effect endpoint section. For time until death of 50% of the tested organisms or median survival time record as LT50*, and write the time in the exposure time section. Record the term used by the author on the back of the coding sheet. If an author calculates both LC50s and LT50*s record the LC50s and note the LT50*s in Other Effects. Incipient LC50s, the concentration at which acute toxicity ceases, are recorded as LC50/ and write in remarks: c/incipient//.

- If LC/EC50 data are given for more than one time period; e.g., 24 hours, 96 hours, and 10 days, record each on a separate entry line. If the author presents LC0s, LC50s, and LC100s, etc., record the LC50 on one line of the form, write Yes in the Other Effects column, and write in the Remarks section: 1/LC0 and LC100 also reported//. If an author does not report a LC50, but only LC0s and/or LC100s, record the LC0 and/or LC100 (both, if given) on separate lines of the form.

- If the endpoint is reported after observation in recovery tanks code the results as a delayed effect. Precede the effect endpoint abbreviation with the letter D; e.g., DEC50IM, followed by a / and report Efct Endpt/effect after X h in recovery tank // in Remarks.

12. Effect

Effect is any reported effect other than LC50 or EC50, including growth and reproduction. Abbreviations of possible effects are listed in Attachment J. The concentration recorded for life-cycle or partial chronic test effects should be the lowest concentration that produced the reported effect at the earliest time. If the author reports a statistically derived no-observed-effect concentration, record that information on a separate line. Fill out separate lines for each effect observed.

For sub-lethal effect test concentrations, one of the following coding methods will apply:

1) If author reports data as statistically significant, record the effect, and in the Remarks section record the percent change (calculate if not given, and asterisk the value) from control or pretreatment, along with the significance level; e.g., Effect: REP/, Remark: d/50* % dec from control, $p < 0.01$//.
2) If data are statistically tested and found to be not significant, report as; e.g., Effect: REP/, Remark: d/2* % dec no. eggs produced, NS//.
3) If significance wasn't reported in the publication, report the effect at the lowest concentration at which it was observed in the terms used by the author; e.g., Effect: REP/, Remark: d/reproduction dec//.

Whenever mortality is observed (unless an LC50 is calculated), fill out a line for each concentration and each time period observed.

Record the percent mortality in Remarks; e.g., d/10 % mort//. If several concentrations have 0 % or 100 % mortality, fill out a line for the lowest concentration with 100 % mortality and/or for the highest concentration with 0 % mortality.

If the test continues through several life stages or generations, there should only be one concentration recorded with an effect --either quantitative or qualitative-- and one with no effect if reported, for each stage or generation, each on a separate coding line. The beginning lifestage is recorded in the lifestage field. Distinguish the generation being affected in the Remarks; e.g., d/10 % dec wt of F1 generation, $p < 0.01$//.

For static tests, if mortality is the endpoint, but new organisms were added at different times after the chemical was applied, persistence (PER) of the chemical is also being monitored. Record the first observation of the effect of the chemical, with additional effects on new organisms recorded in Remarks; e.g., MOR/ in effects column with d/100 % mortality// in Remarks. Report exposure time as the earliest observation; e.g., 1 day, and in Other Effects report the persistence; e.g., L/PER of chem obsvd for 4 d//.

When an endpoint is reported after organisms are transferred to recovery (toxicant-free) test chambers or tanks, code the results as a delayed effect. Precede an effect abbreviation from Attachment J with the letter D; e.g., DMOR, followed by a slash and describe the delayed effect in Remarks; e.g., Efct/50% mortality after 72 h in recovery tanks//.

13. Concentration

The concentration should be expressed in μg/L unless otherwise noted. In certain specified cases the concentration must be reported as some form of the test chemical. For metal salts, if the author reported the concentration as μg/L $CdCl_2$, recalculate the concentration to express as μg/L Cd (see Attachment L); write a slash after the concentration and write in the Remarks: e/as Cd//. Attachment K presents a list of chemicals for which the concentration must be recalculated if not already reported in this way by the author. If the author reports the name of a metal salt but not the formula, the anhydrous formula is assumed for recalculations. Any numbers recalculated by a reviewer are asterisked, and all calculations are recorded on the back of the coding forms. Confidence limits are also asterisked if they are recalculated. On the back of the form, record the value(s) as stated by the author and the calculation(s) performed are recorded. Attachment L provides formulas for conversion factors. Attachment M provides a Periodic Table of the Elements for use in calculations.

Record numbers only, do not include commas; e.g., 10000 not 10,000. Record the 95% confidence intervals or range, if given, under the concentration. If the concentration is reported in units which cannot be converted to μg/L; e.g., mg/kg or μCi/L, record both the numbers and the units in the concentration field. If both measured and nominal concentrations are reported, record only measured concentrations here. If concentrations are measured, but only nominal values are reported, report the nominal conc followed by a slash, and write in the Remarks: conc/based on nominal conc//. If concentrations are based on the active ingredient or formulation, or as the total, un-ionized or dissolved concentration, this is indicated in the concentration (μg/L) box; e.g., 100 μg/L as active ingredient would be recorded as A = 100. Attachment N lists the applicable abbreviations.

If the concentration reported is the only, the lowest or the highest concentration tested, this should be recorded in Remarks.

14. Bioconcentration Factor (BCF)/Residue

General Procedure:

Write BCF, BCFD (based on dry weight), or BCFC (clearance reported) in the effect column, the water concentration of the chemical in the concentration column, and the BCF value and range, if given, in the BCF column. If different specific tissues are analyzed, write BCF/ in the effect column and write in the Remarks: d/describe tissue analyzed//. If only residue concentrations are given along with measured water concentrations, BCF values and ranges are calculated as follows:

$$\text{BCF} = \frac{\text{Amount of chemical in organism or tissue wet organism or tissue or dry weight}}{\text{Amount of chemical in water (or media)}}$$

Units for calculation should be as follows:

$$\frac{\mu g/g}{\mu g/ml} \quad \text{or} \quad \frac{\mu g/kg}{\mu g/L} \quad \text{or} \quad \frac{ppb}{ppb}$$

Specific Information:

- BCF controls need to have tissue residues reported in order to determine whether they are satisfactory or unsatisfactory. A BCF test with an indeterminate (I) control may receive a review code of one (1) if all other test parameters meet the guidelines.

- When control tissue concentrations are greater than test tissue concentrations a BCF is not reported or calculated.

- For author-calculated BCFs in diet or injection exposure, the chemical's concentration should be indicated in units used by author; e.g., mg/kg.

- BCFs reported or calculated as zero, trace or not detected are not coded in the BCF field. If that is the only result from the paper code as a RSD. If there are other codeable results from the paper code the zero BCF in the Other Effects field of these results.

- Radioactivity can be used to calculate BCF ratio*

$$\text{BCF} = \frac{\text{cpm tissue wet weight}}{\text{cpm water}}$$

*ref.: Duncan J. et al., Pestic. Sci. 8: 345-353 (1977)

- BCF or tissue concentration reported as dry weight should not be converted to wet weight by the reviewer.

- Dry weight BCF reported by the author or calculated by the reviewer should be coded in the Effect field as BCFD/ with d/ dry weight tissue conc used // in Remarks.

- If tissue concentration of the chemical is analyzed by extraction methods and the concentration is given for each extraction layer, the BCF must be calculated for each layer and recorded on a separate line of the data coding form. The layer for which each calculation was made should be noted in Remarks.

- If total and dissolved concentrations of metal measured in the water are reported, report or calculate the BCF of tissue using the dissolved concentration. Note the total concentration in Remarks. If only the total metal concentration is reported, report or calculate the BCF using the total concentration.

- If both tissue and water concentrations are reported as a range, do not calculate a BCF. If the tissue concentration is reported as a range and the water concentration is reported as a single value, do calculate the BCF and record the BCF as a range.

- Always remark on elimination, recording the term used by the author; i.e., elimination, depuration, loss, clearance, halflife. Also give a short description of clearance in Remarks, such as: d/elimination halflife = 2 h//. Use the BCFC abbreviation in the Effect field when elimination is included in Remarks unless a dry weight tissue concentration is used. This would be coded as BCFD with clearance noted in Remarks.

- Only use BCF of diet exposure if it is calculated by the author. Record in Remarks what and how the organism was fed.

- If the chemical concentration in a food organism is reported along with the exposure concentration, do not calculate a BCF for the food organism. The food concentration will be reported as a concentration Remark. The type of food organism will be reported in the Remark for exposure type.

- Water measurements must be an average of several readings or taken at the same time as the tissue sample. If water concentration is measured only at the beginning or at times other than tissue sampling and is not an average concentration, this must be indicated in Remarks, and BCF can be calculated.

- For model ecosystem BCF tests calculate the BCF for each organism type and indicate if diet included an organism in the food chain as part of the model ecosystem. Model ecosystem BCF tests receive a review code of 3 as they do not meet criteria for inclusion in the data base as BCF.

- If the author reports one BCF but many residues, record the author's BCF and do not calculate BCF's for the other values. Report the residues in "Other effects" as 1/other residues reported//. Based on reviewer's judgment, BCFs may be calculated if the author-calculated BCF is described in very general terms and cannot be tied to the rest of the experimental procedures.

- If an average concentration is not reported, and the measured concentration decreases throughout the test, calculate the BCF using the water concentration reported for the time the residue was determined and write in Remarks: e/initial conc_________//.

- If the author calculates a BCF using nominal water concentrations but reports measured and nominal water concentrations, the reviewer recalculates the BCF using measured concentrations.

- If water samples are taken at many time periods but only one BCF is reported, use the water sample from the longest time exposure as the water concentration reported. Record in Remarks the time period range during which water samples were taken.

- In a field test, the samples of water and organism must be collected during the same time period and in the same location in order to calculate a BCF.

- For a field test, if water concentration is measured at various depths (i.e., surface, middle, bottom) the BCF must be calculated using each value. The level for which the BCF is calculated should be recorded in Remarks. The reviewers need to use their judgment in summarizing the water concentration when many measurements are reported.

- Use of Residues (RSD):

- Use RSD when residues were reported and the water concentration was measured, but only the nominal concentration was reported.

- Report RSD when both tissue and water concentrations are reported as a range.

- Use RSD if author reports residues as % of chemical accumulated.

- Do not calculate BCF from residue in food and tissue. Record as RSD (residue) instead. Indicate exposure through another exposed organism; e.g., g/fed exposed clams// in Remarks.

- If RSD endpoint is used, the review code is a 3 because these data do not meet criteria for inclusion in the data base as BCF.

15. Exposure Time

For a test duration ≤ 96 hours, express as hours (h). For a test duration > 96 hours, express as days, weeks or months (d, wk, mo) as reported by author. If the author reports the test duration as >96 hours, recalculate as days. If the experiment is a fluctuating or intermittent dosing experiment, record the dosing interval in the exposure time field followed by a slash, and in Remarks record the duration of the experiment (e.g., f/experiment conducted for one wk//). If the organisms are observed after exposure has been discontinued, record duration of actual exposure in exposure time field. Precede the effect with a letter D to indicate a delayed effect; e.g., DMOR in the effect Remark write, d/observed after X days in recovery water //.

16. Life Stage

Record the average and range for the test organisms' age, weight, length, or initial cell concentrations for algae (i.e., # cells/ml). Age should be expressed in hours (h), days (d), months (mo) or years (yr); weight should be expressed in milligrams (mg) or grams (g); and length should be expressed in millimeters (mm) or centimeters (cm). Record any other description given of life stage such as juvenile, fingerling, or instar, or culture phase for algae. If one life stage of an organism, such as adult male, is exposed to the toxicant and the effect is % hatch, life stage would be recorded as ADULT MALE/ with LIFESTG/ male exposed, female unexposed// in Remarks.

17. Exposure Type

The abbreviations for each exposure type are listed in Attachment O. If the place of injection or type of food used are described, write a slash after the exposure type and write the information in Remarks. For food exposure note whether the concentration is as a dose or as the actual toxicant concentration in the food. Also note when the organism is exposed through both the water and diet (this would be reported as D in the exposure field with a Remark about the type of water exposure).

18. Concentration

Record M if measured (concentrations in test chambers or tanks are quantitatively analyzed) or U if unmeasured (nominal). If an author reports both measured concentrations and nominal concentrations, record M/, and write in Remarks section: h/nominal conc rptd, ____µg/L//. If the author measures concentrations but reports nominal concentrations for the effect, record M and put a slash after the concentration with e/based on nominal conc// in Remarks. If the author does not report whether measured or unmeasured, assume unmeasured and record as U.

19. Temperature

Record exposure water temperature here, not holding temperatures. Holding temperatures, if given, should be recorded in Remarks if different from exposure temperatures. The temperatures should be expressed in °C; recalculate Fahrenheit and Kelvin to Celsius (Attachment L). Record the mean and then record the range, if given, beneath the mean. Do not record standard deviations. Numbers preceded by a "±" cannot be used to determine a range.

20. Hardness and Alkalinity

Express test water hardness and alkalinity in mg/liter $CaCO_3$. If the dilution water values are reported, record in the Remarks. Record the mean and then record the range, if given, beneath the mean. Do not record standard deviations. Numbers preceded by "±" cannot be used to determine a range. If the author states only "hard" or "soft" water, then record as HARD or SOFT. If both methyl orange and phenolphthalein alkalinities are reported, record only the methyl orange alkalinity. If only the phenolphthalein alkalinity is reported, record that and write alk/ phenolphthalein// in Remarks.

21. Dissolved Oxygen

Express test water dissolved oxygen in mg/L. If the dilution water values are given, report these in the Remarks. Record the mean and then record the range, if given, beneath the mean. Do not record standard deviations. Numbers preceded by "±" cannot be used to determine a range. Percent saturation of dissolved oxygen may be recorded but be sure to state units. If the author states the water was saturated, record as SAT.

22. pH

Record the mean test water pH and then record the range, if given, beneath the mean. If the dilution water pH is given, report this in the Remarks. Do not record standard deviations. Numbers preceded by "±" cannot be used to determine a range. If a test is conducted in Instant Ocean and pH is not reported, record in the 'k' column as k/ Instant Ocean// and record pH as 8.0-8.4 (documented pH of Instant Ocean).

23. Review Code (also see Attachment P)

The following is intended to be a guide for assigning a quality rating code for acute toxicity tests and is not all-inclusive; the reviewers were selected for experience and competence in the field of aquatic toxicology, and their good judgment is relied upon in making the review code assignments. For guidance in assigning review codes to other types of tests please see the individual sections in the Guidelines. Review code assignments for these tests will be based on the criteria outlined in the individual sections in addition to the reviewers' judgment. Attachment P describes some of the criteria for acute toxicity tests. Different tests within the same paper can receive different review codes. If an author states that cited standard methods were followed, record in the Remarks section as /the type of methods followed//.

#1. Meets all the following criteria:

Methodology section cites acceptable procedures and data quality assured.

Control mortality or effect satisfactory; e.g., ≤ 10% for acute tests.

Toxicant concentration was measured and reported.

A solvent control if a solvent is used.

For organic and nonmetallic inorganic chemicals, at least the temperature, pH, and dissolved oxygen were reported.

For metals, at least the temperature, pH, dissolved oxygen, and either alkalinity or hardness were reported (alkalinity or hardness data not required for saltwater tests).

#2. Meets some criteria:

Procedures generally satisfactory; i.e., followed some standard methods, but:

Control mortality not reported, or high but accounted for statistically.

Or, toxicant concentration was unmeasured;

Or, water chemistry variables not reported;

Or, no solvent control when a solvent is used in the test.

#3. Does not meet criteria

Methods section shows weaknesses in experimental procedures, or insufficient methodology description to judge quality of experiments.

Control mortality unsatisfactory; e.g., greater than 10% and not accounted for statistically.

A static test with unmeasured concentrations conducted in the presence of precipitate or some undissolved chemical or in an unacceptable container; e.g., testing pesticides in a plastic liner. Note this in Remarks.

The test was conducted with chlorinated tap water, distilled water or rain water. Note this in Remarks.

#4. Abstract or Foreign paper

24. Author Correspondence

If a paper is very good and could be rated #1, but one or two parameters are missing, attach note on the paper to explain what was missing. A letter will be sent to the author to request that information. When the reply is received, that letter and the data coding form will be returned to the original reviewer to make adjustments. The bibliography in AQUIRE will note this by adding "author communication used" after the reference. The test may then be rated a #1 if sufficient information was provided. The letter is attached to the hard copy of the paper and filed.

25. Other Chemicals

Record NO if the paper does not contain a test with another chemical in a mixture with the chemical names at the top of the page. Record YES if the paper does contain a test with mixtures of other chemicals. If yes, then write in the Remarks section: j/ formulae or names of chemicals, separated by commas//. Do not list the names of other chemicals reported if they are not tested in a mixture with the chemical names at the top of the form. Chemicals added to change water chemistry should be described in Other Water Chem (see #26) NOT in Other Chemicals (#25).

26. Other Water Chemistry Available

If additional water chemistry variables are reported in the paper, write YES and write in the Remarks section: K/correct chemical formulas for water chemistry variables, separated by commas//. If more than 5 water chemistry variables are reported, write k/see paper // in Remarks. Do not record concentration values except for salinity and conductivity.

27. Other Effects

If the paper describes other effects, write YES and write in the Remarks section: L/describe other effects briefly separating each effect by a comma//. If tests which do not meet AQUIRE coding guidelines are discussed, they should be mentioned in this section. For example, if an author presents results in which a comparison is made between the toxicity of a chemical to healthy organisms and a test with unhealthy organisms, use a line on the form to describe the test with healthy organisms, write YES in the other effects column, write L/tested unhealthy organisms// in the Remarks section.

28. Remarks

- Use the abbreviations listed in Attachment Q when writing Remarks.
- If a carrier was used, write: carrier/name, concentration// in the Remarks.
- If exposure chambers are aerated during the test, write /aeration// in the Remarks section.
- If the test water was filtered, write / filtered water // in the Remarks section.
- If there is a comment about the compound's water solubility, record the author's statement in Remarks.
- If the test organisms are or have been anesthetized, note this in Remarks.
- If the test organisms have been treated for disease or infection and tested without allowing recovery time, note this in Remarks.

- If test organisms are fed or unfed, note this in Remarks.
- If more information is added to the Remarks section which refers to any of the categories listed on the coding sheet, write a / after the information in the coding blank and add information to Remarks preceded by the letter of the category; e.g., write in the Control section S/ and then write b/5% mortality// in the Remarks section.

Notes on Reviewing Algae Papers

An algae test is a bioassay conducted with an organism from either one of the 8 divisions of algae or the Cyanobacteria:

1. Charaphyta - stoneworts
2. Chlorophyta - green algae
3. Cryptophyta - cryptomonads
4. Crysophyta - diatoms, coccolithids, golden algae
4. Cyanophyta (Cyanobacteria) - blue-green algae
5. Euglenophyta - euglenoids
6. Phaeophyta - brown algae
7. Pyrrophyta - dinoflagellates
8. Rhodophyta - red algae
9. Xanthophyta - yellow-green algae

To review an algae paper, follow the Standard AQUIRE Procedures with the following additions:

1) Controls

The most common kind of culture in toxicity testing with algae is the batch culture (static test). Increase in cell numbers in a batch culture follows a characteristic pattern in which the following five phases may usually be recognized: (1) a lag phase, in which no increase in cell numbers is apparent; (2) a log phase, in which cell multiplication is rapid and the number of cells increases in geometric progression; (3) a phase of declining relative growth; (4) a stationary phase, in which the number of cells remains constant; and (5) a death phase.

If the control in a static algae toxicity test behaves in a manner similar to that described above, it is satisfactory and S should be recorded. When examining the effect of toxicants on population growth of algal cultures, it is not necessary for a control to go through all 5 stages described. As long as the control is in stage 2 or 3 it is satisfactory. Once the control reaches stage 4 or 5 it is no longer acceptable to compare the growth of the treated culture to the control culture; and effects should not be recorded after this time.

Because the production of chlorophyll increases with the increase in cell numbers, chlorophyll concentrations can be used similarly to cell abundance to determine if a control is satisfactory or unsatisfactory.

The health or viability of a control culture can also be determined from figures or from tables showing cell abundance or chlorophyll content. (Effects on test cultures must be determined from written statements or tables; toxicity data cannot be obtained from figures.)

A verbal report of the control culture's growth can also be used to determine if it is satisfactory or unsatisfactory. If an author states that "after a short lag phase there was a period of exponential growth followed by a leveling off of the population as the culture approaches stationary phase," the control would be satisfactory (S).

If the author only reports the effect as a % change from the control, but does not provide additional information about the population growth of the control, record I.

A control in a static test is unsatisfactory if: (1) the number of cells decreases, remains the same or fluctuates erratically during the duration of the test; or, (2) no control is used.

If population growth is not the effect being studied, the control culture does not have to be in the active growth phases. As long as the control and treatment cultures are in the same phase and the effect is not altered by the particular growth phase, the control can be satisfactory.

For flow-through (continuous culture) bioassays record:

1) S (satisfactory) if the response of the control (i.e., population growth, chlorophyll content, etc.) does not fluctuate by more than ± 10% over the duration of the test;
2) U (unsatisfactory) if the response of the control does fluctuate by more than ± 10% over the duration of the test;
3) I (indeterminate) if the author lists results only as a % change from the control, but does not report any additional information about the control, or does not report any information regarding the control.

2) Effects

A) Multiple observations (observations made at several times during the same treatment).

To code multiple observations:

1) Record the maximum concentration for occurrence of each type of effect (e.g., PGR, ABD, POP; see Attachment J).
2) Put the time of this effect in the exposure time field (e.g., 48 h). Put the length of the entire experiment in

Remarks, f/4d expt//, if the exposure time is not the same as the duration of the observation.

3) Record all the other observations in the Other Effects field.

B) Code multiple treatments and multiple observations simultaneously. It is common practice in algae tests to expose the test organism to a number of concentrations of a chemical (treatments) and then make multiple observations on each treatment. Data from this type of test is often reported in tabular form. In a test of this type the reviewer should record the lowest concentration and earliest time at which a statistically significant effect at this level was observed. If the author does not mention the significance level of the results, record the lowest concentration and earliest time that the maximum effect occurred.

Example: Test Data for Chlorophenols

Compound	Concentration of Compound (mg/L)	Chlorophyll (mg/L) After 0 Day	After 1 Day	After 2 Days	After 3 Days
m-Chlorophenol	Control	9.6	24.8	74.6	66.8
	10	9.6	24.8	76.0	64.8
	50	9.6	18.4	22.8*	32.0*
	100	9.6	10.0*	9.4*	8.4*
	250	9.6	6.0*	3.2*	1.2*
	500	9.6	0*	0*	0*

* $p < 0.01$

In this example no data can be recorded after 3 days because the control is unsatisfactory (i.e., declining) at this time. If the author stated that the 50 mg/L treatment had a significant effect, the 22.8 mg/L value after day 1 would be coded. If no mention had been made of the significance of the data, the 0 mg/L chlorophyll result at the concentration of 500 mg/L after day one would be coded as BMS/ with /0 mg/L chlorophyll// in Remarks.

3) Remarks

Illumination and the duration of the photoperiod should be reported in the Remarks section as follows:

Example: 1) /5500 lux, 16 h photoperiod//

Footcandles and lumens/m^2 should be converted to lux before being recorded (see Appendix L). If light intensity is recorded as Einsteins (E) or langleys (lg), record them as such. These units cannot be converted to lux.

References

Fogg, G.E. 1975. Algal cultures and phytoplankton ecology, 2nd edition. The University of Wisconsin Press, Madison, WI: 175 p.

Methods Papers

- Fitzgerald, G.P. and S.L. Faust. 1963. Bioassay for Algicidal vs. Algistatic Chemicals. Water Sewage Works: 296-298.
- Giddings, J.M. 1980. Four-hour Algal Bioassays for Assessing the Toxicity of Coal-Derived Materials. Government Reports Announcements and Index 18; NTIS/CONF-800223-2: 19 p.
- Hannan, P.J. and C. Patouillet. 1979. An Algae Toxicity Test and Evaluation of Adsorptive Effect. J. Water Pollut. Control Fed. 51(4): 834-840.
- Hess, F.D. 1980. A Chlamydomonas Algal Bioassay for Detecting Growth Inhibitor Herbicides. Weed Sci. 28(5): 515-520.

- Miller, E.W., J.C. Green, and T. Shiroyama. 1978. The *Selenastrum capricornutum* Printz Algal Assay Bottle Test. EPA-600/9-78-018, Environ. Res. Lab., U.S. Environ. Prot. Agency, Corvallis, OR: 125 p.
- Norland, S., M. Heldal, T. Lien, and G. Knutsen. 1978. Toxicity Testing with Synchronized Cultures of the Green Alga *Chlamydomonas*. Chemosphere 7(3): 231-245.
- Stein, A. and E.C. Keller, Jr. 1973. Gene and Growth Dynamics of *Chlorella* Under Continuous Culture During Phenol Stress. Proc. W. Va. Acad. Sci. 45(2): 103-111.
- United States Environmental Protection Agency. 1971. Algal Assay Procedure Bottle Test. National Eutrophication Research Program: 82 p.
- Walbridge, C.T. 1977. A Flow-Through Testing Procedure with Duckweed (*Lemna minor* L.). EPA Ecol. Res. Series, EPA-600/3-77-108, Environ. Res. Lab., U.S. Environ. Prot. Agency, Duluth, MN: 19 p.

Notes on Reviewing Field Papers

For the purposes of the AQUIRE data base a field test is an experiment conducted in a natural water body, or in an artificial water body that meets all of the following criteria:

1) It is located outdoors;
2) The system has a natural bottom substrate; and
3) Aquatic communities (e.g., bacteria, phytoplankton and zooplankton) have become established.

All other experiments are considered lab tests (example: pond with plastic liner and no substrate).

To review a field test follow the Standard AQUIRE Procedures with the following additions:

1) General Description of Experiment

   Briefly describe in Remarks using the following criteria, if given:

   1) Name and/or type of water body studied (pond, lake, river).
   2) Its size (volume or surface area and depth).
   3) The bottom substrate, if unusual or if the substrate type might affect the results of the experiment (mud, sand, cement, vinyl, liner with 3" organic matter). Be sure to note the type of plastic used to line artificial pools, even if substrate is present.
   4) Location of experimental water body (County, State or Country).
   5) Any type of enclosure used to divide the water body into discrete treatment areas.
   6) Note if aerial application of chemical was used.

Examples: /Lake Mary, MN, surface area 500 m^2, max depth 4 m//

/Artificial pond, TX, 5 x 20 x 1 m, vinyl liner, 3 inch sand substrate//

/Woodland pond, MN, Volume 50000 L, 10 cm diam, 3 ft long plastic enclosures, open top, bottom//

2) Controls

Field requirements for a satisfactory control:

a) A similar water body that was not treated.

b) An untreated, isolated portion of the treated water body.

c) The control population must not show large changes in mortality, abundance, composition or behavior during the test.

d) Pre- and post-treatment populations have not been affected by natural changes (e.g., seasonal population fluctuations), or these changes are well known from extensive baseline studies.

A control is unsatisfactory:

a) If there is any chance of the chemical reaching the control area (thus plastic enclosures in a lake are satisfactory controls; using half of a treated pond as a control is unsatisfactory if it is not separated from the treated portion in any way).

b) If pretreatment samples are compared to post treatment samples and there is a chance that natural changes are occurring in the population. A separate control should be used to monitor natural population changes such as ABD, DRF, and MOR that are occurring during the exposure time.

c) If no control is used.

d) If the natural population "crashes" or fluctuates erratically. Be sure to write U/ with a comment to explain why a control is unsatisfactory.

3) Concentration

a) Report the lowest concentration for an effect which has not been statistically quantified and occurs at all higher levels. (Such an effect could be "increase in DRF", "decrease in ABD".)

b) Report concentrations as µg/L. If reported in units which do not convert to µg/L, report as given by the author (e.g., lb/acre, kg/ha). A table of common conversion factors is given in Attachment L.

4) Exposure Type

T = "in situ", "natural" conditions. The chemical was not added to the water for the experiment. It was already present due to leaching, runoff, sewage outfall, etc. If the source of the chemical is known, mention this in the Remarks.

F = flow-through. A flowing water system with a constant chemical concentration. F/ can be used for a flowing system where the chemical is only added occasionally, if the dosing times are mentioned in the Remarks.

S = static. A lake or pond without inlets or outlets or a static enclosure in any system.

L = A system in which the chemical is lost or diluted during the experiment due to inflow, outflow or mixing with adjacent untreated areas.

R = renewal. Use for field experiments only where the entire volume of water is renewed.

Note: If organisms are exposed in a cage or enclosure that allows mixing with the rest of the water body, place a / after the exposure code and in the Remarks note that the organisms were caged.

General Comments:

If a treated area has not recovered to near its pretreatment conditions (as determined by the author) when compared to the control, or to the pretreatment levels before it is treated the second time, put the results of the second treatment in Other Effects (e.g., if there is an order of magnitude difference between the pre- and post-treatment samples, the area has not recovered). If the area has recovered, the second treatment can be coded as a separate experiment.

5) A field paper receives a review code of 3 if two or more of the following occur:
   1) The chemical concentration is unmeasured
   2) no control was used
   3) no quantitative results are mentioned.

Notes on Reviewing Sediment Papers

If the sediment (natural or prepared) is used as a "carrier" to test the toxicity of one chemical and the concentration of the chemical in the water is measured, then:

a. Make a comment: carrier/(describe type of soil)//

b. In the Conc (µg/L) box list the water concentration with a / and in the comments put e/(a note on when the water concentration reached equilibrium, or if it was increasing or decreasing)//

c. Make a general comment on the test conditions:
/Added ____g soil with ____µg/g chem to ____L water//

If the sediment is used as a "carrier" to test the toxicity of one chemical and the concentration of the chemical in the water is not measured, the paper is not reviewed; these papers are held in the deferred files at ERL-D.

If a natural sediment is used as the test material (i.e., no chemical mixed with it before testing) and only 1 chemical toxicant is present in the soil, code as in (1) or (2) above depending on whether or not the water concentration is measured.

If several chemicals are present in any sediment test, the paper is filed as a mixture paper at ERL-D and is not reviewed.

If the sediment is being used as the test material to study the effects of suspended solids on organisms and no specific chemical toxicant is present in the soil, the paper is not reviewed, and is filed as "no toxicity data" at ERL-D.

General Notes:

If pumps or stirring bars are used to keep the sediment in suspension, note this in general comments.

If a flow-through design is used with sediment in the exposure chamber, the exposure code is L, because the chemical is leaching out of the sediment and then being removed from the system.

Notes on Reviewing Ammonia Papers

Ammonia concentrations should be reported as NH_3-N (un-ionized) and as NH_4-N (total). If only total concentrations are reported, the un-ionized concentrations can be calculated if temperature and pH are reported. For calculations of un-ionized ammonia in freshwater, use the table of Thurston et al. (1979); for saltwater, use the table of Skarheim (1973). Authors report ammonia concentrations in a variety of different forms, so the calculation of un-ionized ammonia-nitrogen must be made very carefully. See Thurston et al. (1979) for calculation instructions and examples.

If temperature and/or pH are reported as ranges, do not calculate un-ionized ammonia. If pH and temperature are reported at each concentration, use those specific values instead of average values.

A review code of #3 should be given to any test which has only a total (NH_4-N) concentration reported for it and the un-ionized ammonia concentration cannot be calculated.

Some exposures are conducted without artificially adding ammonia, but concentrations of naturally accumulated ammonia are measured. Frequently, these tests are conducted in systems with recirculating exposure water. Report the effects caused by ammonia in these systems. Write ammonia as the test chemical and write natural accumulation in the purity/grade section of the form. When ammonia excretion or absorption is reported and ammonia was not artificially added, do not review the paper.

Some authors do not describe the concentration specifically as total or un-ionized. They may just use the word ammonia. If concentration is unmeasured and water chemistries are not reported, it is likely that concentrations are as total-N. These papers must be read over carefully, and careful judgments must be used. If assistance is needed, contact Rosemarie C. Russo.

References

Skarheim, H.P. 1973. Tables of the fraction of ammonia in the undissociated form for pH 6 to 9, temperature 0-30°C, TDS 0-3000 mg/1, and salinity 5-35 g/kg. SERL Report No. 73-5, Sanitary Engineering Research Laboratory, University of California, Berkeley, CA: 33 p.

Thurston, R.V., R.C. Russo, and K. Emerson. 1979. Aqueous ammonia equilibrium - tabulation of percent un-ionized ammonia. EPA Ecol. Res. Ser. EPA-600/3-79-091. Environmental Research Laboratory, U.S. Environmental Protection Agency, Duluth, MN: 427 p.

Notes on Reviewing Chlorine Papers

The concentrations should be reported as Cl_2. For freshwater tests the author should report the concentrations as TRC (total residual chlorine), and for saltwater the concentration should be reported as CPO (chlorine produced oxidant). If concentrations are reported as FRC (free residual chlorine) and as CRC (combined residual chlorine), then add FRC and CRC together to determine the TRC. CRC represents the concentration of chloramines. If only CRC concentrations are reported and the author states that $\geq 95\%$ of the compound was as chloramines, then CRC can be used. Otherwise, if only FRC and CRC are reported, use a review code #3 and write in Remarks: e/ as Cl_2, FRC//.

If the author mixes a hypochlorite salt with an ammonia solution, write chloramine as the chemical name and write in the Purity/Grade section: mixed NaOCl and NH_4Cl (or whatever other chemicals were used).

If chlorine concentrations are not measured, then each test would receive a review code #3.

For intermittent exposures, write R/ in exposure type, write the length of the entire observation period in the exposure time, and describe the exposure in Remarks: f/exposed 3 x 0.5 h per day at 8 h intervals//. Some authors may report the water concentration as the peak concentration during the pulse or as the average concentration during entire test. If this is done, then describe it in Remarks: e/as Cl_2, peak conc//.

ATTACHMENTS

ATTACHMENT A

REFERENCE SEARCH DOCUMENTATION

Introduction

Relevant literature was retrieved through on-line data base searches of the world literature. A comprehensive search was designed to include the effect of virtually any toxic substance on any aquatic organism (except bacteria, adult amphibians, birds, and mammals).

From most data bases the citations were retrieved year by year in order to keep the number of citations to be screened and selected more manageable.

Those files that are continually updated will be searched periodically for new material suitable for AQUIRE.

Basic Search Strategy

Two major elements were identified under the topic of aquatic toxicology toxic effects and aquatic organisms. It was recognized that it would be virtually impossible to search every name of every aquatic plant and animal, therefore the terms used in this search were selected to represent those organisms frequently studied in toxicity bioassays. Also included were broad-range terms for groups of organisms such as: shellfish, zooplankton, algae, and teleosts. Most of the terms were selected from abstracts and citations retrieved from a preliminary search on the aquatic toxicity of ammonia.

Individual Data Base Strategies

Within each data base the search strategies were tailored, whenever feasible to include controlled vocabulary, section headings, and concept codes in order to improve the accuracy of the retrieval. In many cases, this involved the use of both the free-text terms and controlled terms. Controlled terms were selected from users' manuals or by contacting a representative from the data base suppliers.

Tree Searching

In addition, the bibliographies of articles acquired for the search years 1970-1981 were screened for pertinent references. These references, which include dates from 1953 through 1981, were checked against the file of acquired articles for duplication and those that were unique were retained for later acquisition.

Screening Retrieved Citations

As off-line prints were received they were given a preliminary screening to eliminate totally irrelevant material. As this was done early in the project, the guidelines for selection were rather broad.

Acceptable citations included those on any toxic effect on an aquatic organism caused by an anthropogenic substance. Primary consideration was given to acute toxicity studies because they were to be entered into AQUIRE before other types of studies. Articles on bioconcentration, metabolism (uptake, retention, and distribution), residue levels in tissues, reviews, general toxicity studies, and aquatic toxicology methods were also acceptable. Articles on the following topics were considered not suitable for AQUIRE and were screened out:

Thermal pollution
Radioactive pollutants
Eutrophication
Nutrient enrichment

Residue levels in foods; e.g., mercury in fish and shellfish

Naturally occurring toxins in fish, shellfish, microorganisms (red tide), etc.

Bacteria

Viruses and diseases

Selection of Articles to be Acquired

Once the retrieved citations were screened and filed, a final selection of articles to be acquired and coded was undertaken.

These citations were then checked for duplication in both the file of acquired articles and the listing of articles already in the data base at the Environmental Research Laboratory-Duluth.

First priority was given to articles on acute toxicity; i.e., those containing LC50 or EC50 data, which were identified for the entire time period searched. These were acquired as soon as they were screened.

After acquiring acute toxicity articles, a thorough selection process was initiated beginning with 1981 and working back year by year. Acceptable for article acquisition were studies on chronic toxicity or "other effects" from toxicant exposure including: biochemical, hematologic, physiologic, pathologic, teratogenic and mutagenic effects. Foreign articles were acceptable. Studies on pharmaceuticals as the subject chemical are acceptable as long as the organism is aquatic and the Chemical Abstracts Service (CAS) registry number is available.

The criteria for articles not to be acquired were much more explicit. The following types of studies were excluded from article acquisition:

1. Field studies in which:
    - a.) an aquatic community had not become established and there was no natural bottom substrate, or
    - b.) the amount of toxicant applied to the water body was not specified (e.g., herbicide was sprayed on a river and fish kills were observed).
2. General ecology type studies in which toxicity to aquatic organisms was mentioned.
3. Review articles containing some reference to aquatic toxicity were selected from the present back through 1970 for use as reference sources however, some acquisition of review articles was deferred. Those reviews that have been acquired are on file at ERL-D.
4. Complex effluents; for example:
    - a) mixed industrial or sewage effluents
    - b) acid mine wastes
    - c) bleached kraft mill effluents

    Abstracts from this category are delivered to the Complex Effluents Toxicity Information System (CETIS) effort at ERL-D.
5. Oil, including:
    - a) oil spills
    - b) oil products unless compounds were specified, such as naphthalene, benzene, etc.
    - c) water-soluble oil fraction
    - d) crude oil toxicity, even if a controlled laboratory study was done
    - e) petroleum hydrocarbons

6. Radiation exposure, for example:
    a) experimental irradiation (e.g., uv light)
    b) radioactive compounds (americium, cesium, plutonium, etc.)
    c) nuclear power plant wastes, compounds specified or unspecified
    EXCEPTION: radioactive-labeled toxicants.
7. Methods: articles describing a bioassay procedure or method of analysis, unless the article specified a toxicant, procedure, and recorded toxic effects.
8. Effects of physical or chemical characteristics of waters such as salinity, pH, or temperature alone.
    EXCEPTION: the influence of water characteristics (salinity, etc.) on the toxicity of a chemical to aquatic organisms.
9. Nutrients: effects of nutrient enrichment (nitrogen, phosphorous) from fertilizers, eutrophication, or agricultural runoff.
10. Leachates; for example: mining wastes, land disposal sites, highway deicing chemicals.
11. Combinations of toxicants.
12. Sediment papers in which individual chemicals were not identified.
13. Ozone or ozonation studies.
14. Gas supersaturation studies.

Article Acquisition

Once the final selections of retrieved material were made, citations were checked against a list of ERL-D holdings and against existing files of acquired articles for possible duplicates. If the article was not available in a local library, the interlibrary loan system was used for journals, and university microfilms for theses or dissertations. If not obtainable through these channels, the author or coauthor was telephoned if in the U.S. or a letter was written if he/she was out of the country. Foreign journals were obtained if the article appeared in English.

Article Archiving

Acquired articles are logged in as they're received, numbered with their corresponding request number and then forwarded to a staff member to be checked once more for relevancy. Articles that are relevant are photocopied and a reference number is assigned to each article for use as a link between the article and the AQUIRE data base. A hard copy is filed at ERL-D and a microfiche copy is filed at EPA-OTS-Washington.

ATTACHMENT B

REFERENCE FORMAT (RETOX)

The RETOX data file contains the bibliographic citations for all articles used for the AQUIRE data base. The reference numbers are assigned arbitrarily and serve as the link between the AQUIRE data records and the reference from which the data were abstracted. Each reference in RETOX will follow the generalized format given below:

Reference Number

Reference Type

Author(s)

Date

Title

Source

Reference number

The reference number is a unique identifier assigned to each paper that is entered into the data base. This number provides a link between the reference file and the corresponding data for that paper.

Reference type

All papers added to the reference file are assigned a code letter categorizing the paper. An "A" is assigned to all papers that are used in AQUIRE. All other papers will be assigned to one of the categories listed below.

A - AQUIRE
B - Publ. Elsewhere
C - Miscellaneous
D - No Tox. Data
E - Effluents
F - Foreign
H - Hematology
I - Bacteria
L - Leachate
M - Metabolism
O - Oils
P - Physiology
Q - Not Aquatic
R - Review
S - Sediments
W - Water Chem Effects
X - Mixture
Y - Methods

Author(s)

All authors' names will be included for each paper, and will be entirely in capital letters.

Personal names will be as follows:

ABEL,P.D.

If there are two authors, the word "and" will be used to separate them:

HANSEN,D.J. AND A.J.WILSON,JR.

In cases where there are more than 2 authors the format will be as follows:

ABDELGHANI,A.A., J.W.MASON, A.C.ANDERSON, A.J.ENGLANDE, AND J.E.DIEM

with each successive author's name separated by commas and the final author's name joined by "and."

In general, authors' titles such as Sir, Ph.D., and military rank will not be included; however, "Jr." and "the Third" will be entered as follows:

CAIRNS,J.JR. AND W.H.VAN DER SCHALIE or
DOLAN,J.M.III, B.C.GREGG, J.CAIRNS,JR., K.L.DICKSON, AND A.C.HENDRICKS

Foreign names will be written without diacritical marks.

Government or corporate names will be abbreviated whenever possible with standard abbreviations.

Date

Only the year of publication will be given. If the date is a range, the earliest date will be given; e.g., 1974-1976 will be entered as 1974. No months or days will be listed. For papers published by the same authors, in the same year, a letter is assigned in addition to the year. Example:

MARKING,L.L.
1969 A
TOXICITY OF RHODAMINE B AND FLUORESCEIN SODIUM TO
FISH AND THEIR COMPATIBILITY WITH ANTIMYCIN A
PROG. FISH-CULT. 31(3):139-142

MARKING,L.L.
1969 B
TOXICITY OF METHYLPENTYNOL TO SELECTED FISHES
INVEST. FISH CONTROL NO. 30, FISH WILDL. SERV., U.S.D.I.,
WASHINGTON, D.C.: 7 P.

MARKING,L.L.
1969 C
TOXICOLOGICAL ASSAYS WITH FISH
BULL. WILDL. DISEASE ASSOC. 5:291-294

Title

The entire title will be capitalized. Whenever possible the entire title will be written out. In the cases of excessively long titles, "..." will indicate continuation. No punctuation is necessary at the beginning or end of the title, but any punctuation which is contained within the title will be retained. Example:

> STANDARD TEST FISH DEVELOPMENT. PART I. FATHEAD
> MINNOWS (PIMEPHALES PROMELAS) AND GOLDFISH
> (CARASSIUS AURATUS) AS STANDARD FISH IN ...

Combinations of numbers and letters in a title, where a letter has a number sub- or superscript or a number has a letter sub- or superscript, will be written on the same line in the original order. Example:

> H_2O will become H2O
>
> 132_{Cs} will become 132CS
>
> I^{131}will become I131

Source

Journal titles will be abbreviated in accordance with: Bibliographic Guide For Editors and Authors. The American Chemical Society, Washington, D.C., 1974, or Serial Sources for the Biosis Data Base Biosciences Information Services, Philadelphia, PA, 1979.

If an abbreviation for a given journal does not appear in either of these sources, the abbreviation found in Chemical Abstracts Service Source Index (CASSI) will be used.

When a journal is the source, it will be listed as follows in capital letters: Journal title abbreviation, volume, issue in parentheses (if given), pages and language code in parentheses (if other than English). Example:

> J. FISH BIOL. 6(3):279-298

Volume numbers stand alone. They are not preceded by the word "volume," nor does this appear in parentheses.

Issue numbers directly follow the volume number (with no spacing) and are contained in parentheses. The closed parenthesis is followed by a colon.

Page numbers are separated by a hyphen (no spaces). For pages that are not sequential or in instances where only portions of the document were obtained, this will be indicated by commas. Example:

> WASH. DEPT. FISH. RES. BULL. 5:1-4, 156-161

For some publications (including theses, technical reports) list only the number of pages contained in the entire document. Examples:

PH.D. THESIS, UNIVERSITY OF CALIFORNIA, DAVIS, CA:
56 P.; DISSERT. ABSTR. INT. B 37(9):430B

U.S. FISH WILDL. SERV., INVEST. FISH CONTROL 69,
WASHINGTON, DC:9 P.

Foreign Papers

Foreign language articles will be indicated by the appropriate 3 letter language abbreviation in parentheses at the end of the source information. The English title only will be used if it is available.

The list of foreign language abbreviations as used in AQUIRE appears below:

CHI	Chinese	NOR	Norwegian
CZE	Czech; Bohemian	PER	Persian
DAN	Danish	POL	Polish
DUT	Dutch	POR	Portuguese
FRE	French	RUM	Rumanian
GER	German	RUS	Russian
HUN	Hungarian	SLO	Slovenian
ITA	Italian	SPA	Spanish
JPN	Japanese	SWE	Swedish
KOR	Korean	TUR	Turkish

Example:

STROGANOV,N.S., A.G.DMITRIEVA, G.D.LEBEDEVA, AND
N.M.CHERNOVA
1975
EFFECT OF TRIETHYLTIN CHLORIDE ON THE VIABILITY OF
MICROCYSTIS AERUGINOSA
BIOSFERA. CHEL. MATER. VSES. SIMP. 1ST:277-280 (RUS)

Additional Formats

In cases where an article was initially acquired in a language other than English, but later an English translation was obtained, both citations will be listed under the same reference number in the reference file.

This will also apply to abstracts (of dissertations, etc.) for which the complete work was retrieved. The full paper's citation will appear first, followed by the abstract source.

In some instances, the exact same article is available from 2 distinct sources. In these cases, both sources will be listed in the reference number.

Proceedings of Conferences or Symposia

The citations for these will contain the following information whenever available: author, date, title of presentation, name and number of symposium, location (city and 2 letter state abbreviation), and page numbers. Example:

> GLOOSCHENKO,W.A.
> 1971
> THE EFFECT OF DDT AND DIELDRIN UPON 14C UPTAKE BY
> IN SITU PHYTOPLANKTON IN LAKES ERIE AND ONTARIO
> PROC. 14TH CONF. GREAT LAKES RES., INT. ASSOC.
> GREAT LAKES RES., ANN ARBOR, MI:219-223

Book citations

The citations for these will contain the author, date, title of the article (or chapter), editor (if different from author), title of the book, publisher, place of publication, and page numbers. Example:

> BLOCK,R.M., D.T.BURTON, S.R.GULLANS, AND
> L.B.RICHARDSON
> 1978
> RESPIRATORY AND OSMOREGULATORY RESPONSES OF WHITE
> PERCH (MORONE AMERICANA) EXPOSED TO CHLORINE AND
> OZONE IN ESTUARINE WATERS
> IN: R.L.JOLLEY, H.GORCHEV, AND D.H.HAMILTON,JR.
> (EDS.), PROC. 2ND CONF. ON WATER CHLORINATION:
> ENVIRON. IMPACT HEALTH EFF., VOL. 2, ANN ARBOR SCI.
> PUBL., ANN ARBOR, MI:351-360

Corporate authors

In cases where no specific author is given and the organization producing the work can be identified, the corporate author will be used. Examples:

> DOW CHEMICAL CO.
> 1976
> ENVIRONMENTAL BEHAVIOR OF AQUEOUS ACRYLAMIDE:
> BIODEGRADABILITY AND FISH TOXICITY
> DOW CHEMICAL CO., TECHNICAL REPORT FORM NO. 192-476-76, DESIGNED
> PRODUCTS DEPT., MIDLAND, MI: 36 P.

Corporate author examples, continued:

MINISTRY OF TECHNOLOGY, U.K.
1968
EFFECTS OF POLLUTION ON FISH
WATER POLLUTION RESEARCH 1967, H.M.
STATIONERY OFFICE, LONDON: 56-66

Anonymous articles

Citations for papers for which no specific author, performing organization, or sponsoring body is given will list the author as: "Anonymous."

Theses

The format for theses will be as follows: author, date, title of paper, degree, college or university, location (city, state, country if non-U.S.), number of pages. The standard 2-letter abbreviations for states will be used here also. Example:

FAVA,J.A.JR.
1975
THE BEHAVIORAL RESPONSES OF BLACKNOSE DACE,
'RHINICHTHYS ATRATULUS' (HERMANN), TO DOMESTIC
SEWAGE EFFLUENTS AND THEIR TOXIC CONSTITUENTS
PH.D. THESIS, UNIVERSITY OF MARYLAND, COLLEGE PARK,
MD: 128 P.

EPA report citations

Reports in EPA report series would be cited as follows: author, date, title, EPA report number, U.S. EPA, location (city, state), number of pages (either total or in part). Example:

SNARSKI,V.M. AND F.A.PUGLISI
1976
EFFECTS OF AROCLOR 1254 ON BROOK TROUT, SALVELINUS
FONTINALIS
EPA-600/3-76-112, U.S. EPA, DULUTH, MN: 34 P.

If author(s) are not given, write U.S. Environmental Protection Agency as author.

Other government publications

Another common citation is an article that appears in a serial government publication. Citation example:

MARKING,L.L.
1972 B
METHODS OF ESTIMATING THE HALF-LIFE OF BIOLOGICAL
ACTIVITY OF TOXIC CHEMICALS IN WATER
IN: INVEST. FISH CONTROL NO. 46, FISH
WILDL. SERV., BUR. SPORT FISH. WILDL., U.S.D.I.,
WASHINGTON, D.C.:3-9

NTIS publications

These publications will be listed under author's name, if given or under the sponsoring government agency. The citation lists the author (or sponsoring government agency), year, title of publication, NTIS number, and pages. Example:

> O'CONNOR,J.M., D.A.NEUMANN, AND J.A.SHERK,JR.
> 1976
> LETHAL EFFECTS OF SUSPENDED SEDIMENTS ON ESTUARINE
> FISH
> GOVT. REP. ANNOUNCE. INDEX 7712, U.S. NTIS AD-
> A037 377: 38 P.

In cases where an NTIS number is given in addition to other citation information both will be listed under the same reference number. Example:

> METCALF,R.L.
> 1976
> ROLE OF MIXED FUNCTION OXIDASES IN INSECTICIDE ACTION
> EPA-600/1-76-002, U.S. EPA, RESEARCH TRIANGLE PARK, NC;
> U.S. NTIS PB-251 709: 42 P.

Publications given with NTIS numbers may be obtained from: National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

Published elsewhere

In cases where a thesis or technical report has been obtained, and this document has been published either completely or in part in another publication, the reference type will be a "B". Following the source citation, the AQUIRE reference numbers of the articles which are published from this document will appear in parentheses. Example:

> FROMM,P.O.
> 1977
> TOXIC EFFECT OF WATER SOLUBLE POLLUTANTS ON FRESH-
> WATER FISH
> EPA-600/3-77-057, U.S. EPA, DULUTH, MN; U.S. NTIS
> PB-272 092: 63 P. (PUBL AS 2170, 8840, 8942,
> 15045, 15069, 15083, 15084, 15085)

Author Communication Used

In instances where additional (unpublished) information was obtained through correspondence with the author, the words "Author Communication Used" will follow the journal citation in parentheses. Example:

> SMITH,P.J., A.J.CROWE, V.G.K.DAS, AND J.DUNCAN
> 1979
> STRUCTURE-ACTIVITY RELATIONSHIPS FOR SOME ORGANOTIN
> MOLLUSCICIDES
> PESTIC. SCI. 10(5):419-422 (AUTHOR COMMUNICATION USED)

ATTACHMENT C

CAS NUMBER VERIFICATION AND ASSIGNMENT PROCEDURE

The following is the procedure for adding new Chemical Abstract Services (CAS) registry numbers to the reference file at ERL-D:

1. Copy the chemical name from the coding form to a file card putting reference number, synonyms and formulas on a line below the name. Toxicants reported in the hydrous salt form will be assigned the CAS # for the anhydrous form. The name on the file card should also be written in the anhydrous form: e.g., if the paper says $CuSO_4.5H_2O$, the card should be written as $CuSO_4$ and the $CuSO_4$ CAS # assigned. When writing the CAS cards use 'f' instead of "pH" for any sulphate (sulfate) salt recorded on the coding sheets.
2. Look up the chemical in Toxic Substances Control Act (TSCA) Inventory. Record the CAS number in the upper right hand corner of the card with the chemical formula on a line below the name. Write "OK TSCA" on the card. If the chemical is not in TSCA, write "no # TSCA" and see procedure #4.
3. Look up the chemical in the Registry of Toxic Effects of Chemical Substances (RTECS). Verify the number from TSCA, writing "OK RTECS" along with the RTECS location number in parentheses on the line below "OK TSCA." Circle the verified CAS number in red. Leave the card in the RTECS book to be proofed by the data coordinator. The card will be returned for filing. If the chemical is not in RTECS, write "no # RTECS" and see procedure #4.
4. Since all CAS numbers must be verified in both TSCA and RTECS, if the chemical and its CAS number is in only one of those sources,

it must be verified by a designated second source. Write "sent to and the date in red on the card below "no # TSCA/RTECS." Send alphabetized lists of the new chemicals with their reference numbers to the second source. File the card(s). When a CAS number list returns from the second source, record the new CAS numbers on their respective cards as described in procedure #2 and circle the number in red. Write "VERIFIED" and the date on the card. The CAS numbers are to be proofed by the data coordinator from the cards against the list received from the second source. File the cards.

The following is an outline of the procedure for assigning a CAS number to a chemical on the data coding forms using the CAS # reference file at ERL-D:

1. Match the spelling exactly to the names on the file card. If you suspect a misspelling, check the paper. If synonyms are given, match all the names to their respective cards. Do not assign a number unless all the names on the card(s) and form agree. If no card exists for a given chemical, make one and follow the procedure for adding new CAS numbers to the reference file. Commercial products with similar trade names which all contain the same active ingredient will be assigned the CAS # for the most common trade name. For example, Malathion 500 would be assigned the CAS # for Malathion.
2. Assign only those CAS numbers verified in both RTECS and TSCA or by the second source. Do not assign CAS numbers from cards that

say "sent to verify" or "OK UMD" or "OK ISHOW" (other data bases) unless they are also verified by both RTECS and TSCA, or by the second source.

3. Double check each CAS number for every chemical on all the coding forms before sending the forms to be keypunched. Correct CAS numbers are essential!

The following are the rules for alphabetizing CAS number cards for chemicals in the file:

1. Prefixes:

   m, o, p
   alpha ( ), beta ( ), delta ( ), gamma ( )
   bis, sec (s), tert (t)
   d, dL, L
   +, ±, -
   any numbers

   Start alphabetizing with the chemical name. Ignore the prefix(es) initially when alphabetizing. If there is more than one chemical with the same identical name but different prefixes, alphabetize using the prefixes in the order listed above. For example, xylene and xylene with ortho, meta and para isomers would be alphabetized xylene, m-xylene, o-xylene, and p-xylene. Identical chemicals with numerical prefixes are filed in numerical order. For example, three dichlorobenzenes would be filed in the following order: 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene.

2. Search two or three cards before and after the correct location for the chemical name.

The following is the procedure used by the second source for adding CAS numbers to the reference file at ERL-D:

1. Search updated versions of RTECS and TSCA for potential CAS numbers. Search CAS microfiche to verify RTECS and TSCA CAS numbers.
2. If #1 is unsuccessful, check the original reference for (a) the correct spelling of the chemical in question; if the spelling on the coding form (hence, on the chemical list) was wrong, check CAS sources for the correct name, and make a note of the misspelling; (b) the chemical formulation and/or active ingredient. If there is only one active ingredient, the CAS # for the active ingredient can be assigned to the chemical. For example, Gramoxon has an active ingredient of 25% paraquat dichloride and is assigned the paraquat dichloride CAS #.
3. If #1 and 2 above are unsuccessful, the following supplemental sources are checked for synonyms:
    - Nanogen Index
    - Pesticide Index
    - Farm Chemicals Handbook
    - Aldrich Dyes and Reagents
    - Merck Index
    - American Drug Index
    - Agricultural Chemicals
    - Chemistry of Pesticides
    - CRC Handbook of Chemical Synonyms and Trade Names

- U.S.D.I., Fish and Wildlife Service, Resource Pub. 137
- search CAS Formula Index, when applicable

4. If #1-3 above are unsuccessful, go on line to search the following:
   - CA Search for particular papers
   - CHEMNAME for CAS #'s and Chemical Names

   - CHEMSIS for CAS #'s of Singly Indexed Substances
   - search CAS Registry Handbook-Number Section supplements when given unknown and unmatched CAS #'s.

ATTACHMENT D

SPECTAR: SPECIES TALLY AND RECORD

The following list includes all species and organism groups included in AQUIRE. The list is ordered according to taxonomic grouping; i.e., Cyanobacteria, Protozoa, Algae, etc. (Attachment E). The species number is an arbitrary number assigned in AQUIRE; the Latin and common names are verified as the most current names in use; the major and minor codes (Attachment E) are assigned to facilitate searching on a broader level than single species and the RESPEC number is a link to the reference (Attachment F) used to verify the organism name and grouping. Species with no major/minor group or reference number have not yet been verified as accurate.

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1825	Sporotetras pyriformis	Xxx			0
1406	Aquatic community	Aquatic Community	MI	AQCO	99
880	Arthropoda	Arthropod Phylum	MI	AQIN	3
488	Invertebrates	Invertebrates	MI	AQIN	99
706	Plankton	Plankton	MI	AQPL	99
337	Agmenellum quadruplicatum	Blue-Green Algae	CY	CYAN	19
1816	Agmenellum sp	Blue-Green Algae	CY	CYAN	19
1956	Anabaena aphanizomendoides	Blue-Green Algae	CY	CYAN	166
1968	Anabaena catenula	Blue-Green Algae	CY	CYAN	12
1755	Anabaena circinalis	Blue-Green Algae	CY	CYAN	11
979	Anabaena cylindrica	Blue-Green Algae	CY	CYAN	19
471	Anabaena flos-aquae	Blue-Green Algae	CY	CYAN	19
1875	Anabaena inaequalis	Blue-Green Algae	CY	CYAN	19
546	Anabaena sp	Blue-Green Algae	CY	CYAN	11
1876	Anabaena spiroides	Blue-Green Algae	CY	CYAN	11
552	Anabaena variabilis	Blue-Green Algae	CY	CYAN	19
1955	Anabaenopsis raciborskii	Blue-Green Algae	CY	CYAN	11
1485	Anacystis aeruginosa	Blue-Green Algae	CY	CYAN	166
1767	Anacystis alpicola	Blue-Green Algae	CY	CYAN	0
1591	Anacystis dimidiata	Blue-Green Algae	CY	CYAN	47
1949	Anacystis flos-aquae	Blue-Green Algae	CY	CYAN	166
1754	Anacystis incerta	Blue-Green Algae	CY	CYAN	47
2035	Anacystis limneticus	Blue-Green Algae	CY	CYAN	0
338	Anacystis marina	Blue-Green Algae	CY	CYAN	19
1766	Anacystis membranina	Blue-Green Algae	CY	CYAN	0
428	Anacystis nidulans	Blue-Green Algae	CY	CYAN	19
1556	Anacystis sp	Blue-Green Algae	CY	CYAN	11
1624	Aphanizomenon flos-aquae	Blue-Green Algae	CY	CYAN	11
1568	Aulosira fertilissima	Blue-Green Algae	CY	CYAN	19
229	Aulosira prolifica	Blue-Green Algae	CY	CYAN	67
1987	Aulosira sp	Blue-Green Algae	CY	CYAN	11
1879	Calothrix anomala	Blue-Green Algae	CY	CYAN	12
1717	Calothrix braunii	Blue-Green Algae	CY	CYAN	43
1988	Calothrix elenkinii	Blue-Green Algae	CY	CYAN	19
1969	Calothrix membranacea	Blue-Green Algae	CY	CYAN	12
1762	Calothrix parietina	Blue-Green Algae	CY	CYAN	19
1063	Chloridella simplex	Blue-Green Algae	CY	CYAN	0

Reproduced from best available copy.

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
458	Chloroflexus aurantiacus	Blue-Green Algae	CY	CYAN	132
2126	Chlorogloea fritschii	Blue-Green Algae	CY	CYAN	19
1798	Chroococcus sp	Blue-Green Algae	CY	CYAN	11
1878	Coccochloris cedrorum	Blue-Green Algae	CY	CYAN	100
1486	Coccochloris elabens	Blue-Green Algae	CY	CYAN	19
1162	Coccochloris halophytica	Blue-Green Algae	CY	CYAN	107
1017	Coccochloris lividus	Blue-Green Algae	CY	CYAN	100
2131	Coccochloris minervae	Blue-Green Algae	CY	CYAN	100
1768	Coccochloris peniocystis	Blue-Green Algae	CY	CYAN	19
1947	Cyanophyta	Blue-Green Algae	CY	CYAN	11
1989	Cylindrospermum muscicola	Blue-Green Algae	CY	CYAN	166
1341	Cylindrospermum sp	Blue-Green Algae	CY	CYAN	11
1589	Cylindrospermum licheniforme	Blue-Green Algae	CY	CYAN	12
1926	Eucapsis sp	Blue-Green Algae	CY	CYAN	11
1880	Fischerella muscicola	Blue-Green Algae	CY	CYAN	19
1928	Fischerella sp	Blue-Green Algae	CY	CYAN	19
1756	Gloeotrichia echinulata	Blue-Green Algae	CY	CYAN	11
1764	Lyngbya birgei	Blue-Green Algae	CY	CYAN	11
657	Lyngbya sp	Blue-Green Algae	CY	CYAN	11
2102	Mastigocladus laminosus	Blue-Green Algae	CY	CYAN	19
1929	Microcoleus chthonoplastes	Blue-Green Algae	CY	CYAN	19
1861	Microcoleus sp	Blue-Green Algae	CY	CYAN	11
498	Microcoleus vaginatus	Blue-Green Algae	CY	CYAN	11
1372	Myxosarcina spectabilis	Blue-Green Algae	CY	CYAN	67
1648	Nostoc calcicola	Blue-Green Algae	CY	CYAN	19
1763	Nostoc commune	Blue-Green Algae	CY	CYAN	12
1606	Nostoc fritschii	Blue-Green Algae	CY	CYAN	19
2071	Nostoc linckia	Blue-Green Algae	CY	CYAN	19
1476	Nostoc muscorum	Blue-Green Algae	CY	CYAN	12
1970	Nostoc punctiforme	Blue-Green Algae	CY	CYAN	19
1607	Nostoc sp	Blue-Green Algae	CY	CYAN	11
1950	Oscillatoria amphibia	Blue-Green Algae	CY	CYAN	19
205	Oscillatoria limnetica	Blue-Green Algae	CY	CYAN	100
396	Oscillatoria sp	Blue-Green Algae	CY	CYAN	11
2068	Oscillatoria terebreviformis	Blue-Green Algae	CY	CYAN	19
1971	Oscillatoria tenuis	Blue-Green Algae	CY	CYAN	12
1927	Oscillatoria williamsi	Blue-Green Algae	CY	CYAN	100
1064	Phormidium foveolarum	Blue-Green Algae	CY	CYAN	19
2129	Phormidium sp	Blue-Green Algae	CY	CYAN	19
1718	Phormidium tenue	Blue-Green Algae	CY	CYAN	19
1491	Plectonema boryanum	Blue-Green Algae	CY	CYAN	12
1719	Plectonema nostocorum	Blue-Green Algae	CY	CYAN	44
2113	Pseudanabaena sp	Blue-Green Algae	CY	CYAN	19
404	Schizothrix calcicola	Blue-Green Algae	CY	CYAN	19
1877	Schizothrix sp	Blue-Green Algae	CY	CYAN	11
2101	Spirulina labyrinthiformis	Blue-Green Algae	CY	CYAN	11
1588	Spirulina platensis	Blue-Green Algae	CY	CYAN	19
1720	Symploca erecta	Blue-Green Algae	CY	CYAN	0
1608	Tolypothrix tenuis	Blue-Green Algae	CY	CYAN	11
2112	Westiellopsis sp	Blue-Green Algae	CY	CYAN	19
1945	Wollea bharadwajae	Blue-Green Algae	CY	CYAN	19
1917	Acanthamoeba castellanii	Amoeba	PR	PROT	185
1396	Amoeba proteus	Amoeba	PR	PROT	46
1692	Amoeba sp	Amoeba	PR	PROT	46
1395	Blepharisma sp	Ciliate	PR	PROT	46

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2115	Bursaria sp	Ciliate	PR	PROT	46
1415	Chaos sp	Amoeba	PR	PROT	46
410	Colpidium campylum	Ciliate	PR	PROT	46
2114	Colpidium colpoda	Ciliate	PR	PROT	185
1463	Cristigera sp	Ciliate	PR	PROT	185
1500	Crithidia fasciculata	Flagellate	PR	PROT	185
872	Euplotes vannus	Ciliate	PR	PROT	97
2096	Foraminiferida	Foraminiferan Order	PR	PROT	46
2097	Infusoria	Aggregate Of Protozoans	PR	PROT	99
814	Marginopora vertebralis	Foraminifera	PR	PROT	95
1188	Paramecium aurelia	Ciliate	PR	PROT	46
431	Paramecium bursaria	Ciliate	PR	PROT	46
1165	Paramecium caudatum	Ciliate	PR	PROT	46
432	Paramecium micronucleatum	Ciliate	PR	PROT	0
1394	Paramecium multimicronucleatum	Ciliate	PR	PROT	46
1045	Paramecium putrinum	Ciliate	PR	PROT	46
1501	Paramecius sp	Ciliate	PR	PROT	46
1393	Peranema trichophorum	Flagellate	PR	PROT	46
1418	Protozoa	Protozoan Phylum	PR	PROT	46
1401	Stentor coeruleus	Ciliate	PR	PROT	46
1858	Stentor sp	Ciliate	PR	PROT	46
1011	Stylonychia mytilus	Ciliate	PR	PROT	46
1154	Stylonychia notophora	Ciliate	PR	PROT	185
484	Tetrahymena pyriformis	Ciliate	PR	PROT	185
1797	Tetrahymena vorax	Ciliate	PR	PROT	97
1417	Vorticella campanula	Ciliate	PR	PROT	46
897	Vorticella nebulifera	Ciliate	PR	PROT	185
482	Algae	Algae,Phytoplankton, Algal Mat	AL	ALGU	47
1242	Schistidium alpicola	Phytoplankton	AL	ALGU	0
2257	Acetabularia mediterranea	Green Algae	AL	CHLO	12
1967	Actinastrum sp	Green Algae	AL	CHLO	11
557	Ankistrodesmus sp	Green Algae	AL	CHLO	11
1320	Ankistrodesmus falcatus v. aci	Green Algae	AL	CHLO	44
497	Ankistrodesmus falcatus	Green Algae	AL	CHLO	43
1181	Ankistrodesmus spiralis	Green Algae	AL	CHLO	11
946	Ankistrodesmus braunii	Green Algae	AL	CHLO	43
2139	Brachiomonas submarina	Green Algae	AL	CHLO	11
1833	Bracteacoccus cinnabarinus	Green Algae	AL	CHLO	12
1489	Bryopsis plumosa	Green Algae	AL	CHLO	12
1809	Carteria eugametos	Green Algae	AL	CHLO	12
1999	Carteria sp	Flagellate Green Algae	AL	CHLO	62
815	Caulerpa sp	Green Algae	AL	CHLO	41
1904	Chlamydomonas angulosa	Green Algae	AL	CHLO	12
1721	Chlamydomonas communis	Green Algae	AL	CHLO	0
1472	Chlamydomonas eugametos	Green Algae	AL	CHLO	12
370	Chlamydomonas globosa	Green Algae	AL	CHLO	62
1922	Chlamydomonas geitleri	Green Algae	AL	CHLO	0
1478	Chlamydomonas moewusii	Green Algae	AL	CHLO	12
980	Chlamydomonas nivalis	Green Algae	AL	CHLO	12
1722	Chlamydomonas paradoxa	Green Algae	AL	CHLO	0

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
318	Chlamydomonas reinhardtii	Green Algae	AL	CHLO	39
1000	Chlamydomonas sp	Green Algae	AL	CHLO	12
1477	Chlamydomonas variabilis	Green Algae	AL	CHLO	106
1851	Chlorella 580	Green Algae	AL	CHLO	12
1850	Chlorella a	Green Algae	AL	CHLO	12
470	Chlorella autotrophica	Green Algae	AL	CHLO	12
555	Chlorella ellipsoidea	Green Algae	AL	CHLO	11
1047	Chlorella emersonii	Green Algae	AL	CHLO	0
962	Chlorella fusca	Green Algae	AL	CHLO	48
1679	Chlorella kessleri	Green Algae	AL	CHLO	12
1932	Chlorella pyrenoidosa sorkinia	Green Algae	AL	CHLO	0
426	Chlorella pyrenoidosa	Green Algae	AL	CHLO	11
638	Chlorella salina	Green Algae	AL	CHLO	12
584	Chlorella sorokiniana	Green Algae	AL	CHLO	12
311	Chlorella sp	Green Algae	AL	CHLO	11
1946	Chlorella stigmatophora	Green Algae	AL	CHLO	12
1590	Chlorella variegata	Green Algae	AL	CHLO	12
479	Chlorella vulgaris	Green Algae	AL	CHLO	11
1723	Chlorobotrys regularis	Green Algae	AL	CHLO	65
1724	Chlorococcum humicola	Green Algae	AL	CHLO	11
1255	Chlorococcum hypnosporum	Green Algae	AL	CHLO	12
300	Chlorococcum sp	Green Algae	AL	CHLO	11
817	Chlorodesmis fastigiata	Green Algae	AL	CHLO	0
1151	Chlorophyta	Green Algae Division	AL	CHLO	11
1351	Cladophora glomerata	Green Algae	AL	CHLO	11
509	Cladophora sp	Green Algae	AL	CHLO	11
1972	Closterium littorale	Green Algae	AL	CHLO	12
1846	Closterium sp	Green Algae	AL	CHLO	11
1725	Coccomyxa simplex	Green Algae	AL	CHLO	12
2281	Coccomyxa sp	Green Algae	AL	CHLO	43
1805	Codium fragile	Green Algae	AL	CHLO	106
1951	Coelastrum microporum	Green Algae	AL	CHLO	11
1726	Coelastrum proboscideum	Green Algae	AL	CHLO	11
547	Cosmarium botrytis	Green Algae	AL	CHLO	12
1891	Cylindrocapsa involuta	Green Algae	AL	CHLO	12
2103	Dicrateria inornata	Green Algae	AL	CHLO	12
434	Dictyosphaerium	Green Algae	AL	CHLO	11
1886	Draparnaldia plumosa	Green Algae	AL	CHLO	11
2178	Draparnaldia sp	Green Algae	AL	CHLO	11
1583	Dunaliella bioculata	Green Algae	AL	CHLO	12
1735	Dunaliella euchlora	Green Algae	AL	CHLO	48
2008	Dunaliella grossi	Green Algae	AL	CHLO	0
317	Dunaliella marina	Green Algae	AL	CHLO	0
472	Dunaliella primolecta	Green Algae	AL	CHLO	12
2098	Dunaliella salina	Green Algae	AL	CHLO	11
464	Dunaliella sp	Green Algae	AL	CHLO	62
298	Dunaliella tertiolecta	Green Algae	AL	CHLO	12
1105	Enteromorpha compressa	Green Algae	AL	CHLO	12
1903	Enteromorpha crinata	Green Algae	AL	CHLO	11
1106	Enteromorpha intestinalis	Green Algae	AL	CHLO	11
1801	Enteromorpha linza	Green Algae	AL	CHLO	12
1345	Enteromorpha sp	Green Algae	AL	CHLO	11
454	Eudorina elegans	Green Algae	AL	CHLO	11
1727	Gloeocystis grevillei	Green Algae	AL	CHLO	180

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1882	Gloeocystis vesiculosa	Green Algae	AL	CHLO	11
1794	Golenkinia minutissima	Green Algae	AL	CHLO	12
1892	Golenkinia radiata	Green Algae	AL	CHLO	11
2007	Golenkinia sp	Green Algae	AL	CHLO	11
1830	Gongrosira sp	Green Algae	AL	CHLO	11
453	Gonium pectorale	Green Algae	AL	CHLO	11
2092	Haematococcus capensis	Green Algae	AL	CHLO	12
1890	Haematococcus droebakensis	Green Algae	AL	CHLO	12
1731	Haematococcus lacustris	Green Algae	AL	CHLO	11
816	Halimeda sp	Green Algae	AL	CHLO	39
2255	Hormidium sp	Green Algae	AL	CHLO	11
1555	Hydrodictyon reticulatum	Green Algae	AL	CHLO	11
1819	Hydrodictyon sp	Green Algae	AL	CHLO	11
1599	Kirchneriella sp	Green Algae	AL	CHLO	11
1728	Mesotaenium caldariorum	Green Algae	AL	CHLO	12
2006	Micrasterias sp	Green Algae	AL	CHLO	11
1827	Microspora sp	Green Algae	AL	CHLO	11
1832	Mougeotia sp	Green Algae	AL	CHLO	11
328	Nannochloris oculata	Green Algae	AL	CHLO	12
1867	Nannochloris sp	Green Algae	AL	CHLO	12
312	Neochloris sp	Green Algae	AL	CHLO	12
412	Oedogonium cardiacum	Green Algae	AL	CHLO	12
1884	Oedogonium foveolatum	Green Algae	AL	CHLO	12
1831	Oedogonium sp	Green Algae	AL	CHLO	12
1729	Oocystis lacustris	Green Algae	AL	CHLO	11
1730	Oocystis marssonii	Green Algae	AL	CHLO	12
1962	Ourococcus sp	Green Algae	AL	CHLO	11
1888	Pandorina morum	Green Algae	AL	CHLO	11
1813	Pandorina sp	Green Algae	AL	CHLO	11
554	Pediastrum biradiatum	Green Algae	AL	CHLO	11
1889	Pediastrum duplex	Green Algae	AL	CHLO	198
1800	Pediastrum sp	Green Algae	AL	CHLO	11
2282	Pediastrum tetras	Green Algae	AL	CHLO	43
1734	Phytoconis sp	Green Algae	AL	CHLO	43
1554	Pithophora oedogonia	Green Algae	AL	CHLO	11
1860	Pithophora sp	Green Algae	AL	CHLO	11
1866	Platymonas sp	Green Algae	AL	CHLO	11
529	Platymonas subcordiformis	Green Algae	AL	CHLO	11
2070	Platymonas tetrathele	Green Algae	AL	CHLO	62
553	Pleodorina californica	Green Algae	AL	CHLO	12
2034	Prasinocladus marinus	Green Algae	AL	CHLO	62
914	Prototheca zopfii	Green Algae	AL	CHLO	12
2009	Pyramimonas grossi	Green Algae	AL	CHLO	62
1594	Rhizoclonium hieroglyphicum	Green Algae	AL	CHLO	11
1760	Rhizoclonium sp	Green Algae	AL	CHLO	11
1339	Scenedesmus abundans	Green Algae	AL	CHLO	65
2175	Scenedesmus acutiformis	Green Algae	AL	CHLO	166
981	Scenedesmus acuminatus	Green Algae	AL	CHLO	12
1481	Scenedesmus basiliensis	Green Algae	AL	CHLO	12
1480	Scenedesmus bijugatus	Green Algae	AL	CHLO	65
2254	Scenedesmus dimorphus	Green Algae	AL	CHLO	12
429	Scenedesmus obliquus	Green Algae	AL	CHLO	11
556	Scenedesmus obtusiusculus	Green Algae	AL	CHLO	65
1190	Scenedesmus opoliensis	Green Algae	AL	CHLO	43

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
487	Scenedesmus quadricauda	Green Algae	AL	CHLO	12
47	Scenedesmus sp	Green Algae	AL	CHLO	11
1753	Schizogonium sp	Green Algae	AL	CHLO	43
1883	Schizomeris leibleinii	Green Algae	AL	CHLO	11
1742	Schroederia setigera	Green Algae	AL	CHLO	11
486	Selenastrum capricornutum	Green Algae	AL	CHLO	12
2004	Sphaeroplea annulina	Green Algae	AL	CHLO	11
1475	Spirogyra azygospora	Green Algae	AL	CHLO	166
2179	Spirogyra singularis	Green Algae	AL	CHLO	44
1503	Spirogyra sp	Green Algae	AL	CHLO	11
1885	Staurastrum sp	Green Algae	AL	CHLO	11
327	Stichococcus bacillaris	Green Algae	AL	CHLO	11
1769	Stichococcus sp	Green Algae	AL	CHLO	11
1973	Stigeoclonium helveticum	Green Algae	AL	CHLO	11
1733	Stigeoclonium nanum	Green Algae	AL	CHLO	44
699	Stigeoclonium pachydermum	Green Algae	AL	CHLO	44
1699	Stigeoclonium sp	Green Algae	AL	CHLO	11
1829	Stigeoclonium tenue	Green Algae	AL	CHLO	11
1906	Tetraselmis chuii	Green Algae	AL	CHLO	12
324	Tetraselmis maculata	Green Algae	AL	CHLO	48
1881	Ulothrix fimbriata	Green Algae	AL	CHLO	12
2091	Ulothrix flacca	Green Algae	AL	CHLO	39
1826	Ulothrix sp	Green Algae	AL	CHLO	11
2177	Ulothrix verrucosa	Green Algae	AL	CHLO	0
1107	Ulva lactuca	Green Algae	AL	CHLO	12
1636	Ulva rigida	Green Algae	AL	CHLO	166
1301	Ulva sp	Green Algae	AL	CHLO	11
1828	Ulvella frequens	Green Algae	AL	CHLO	0
1820	Volvox sp	Green Algae	AL	CHLO	11
1974	Zygnema circumcarinatum	Green Algae	AL	CHLO	12
1821	Zygnema sp	Green Algae	AL	CHLO	11
1089	Chara sp	Stonewort	AL	CHRO	18
1325	Chara vulgaris	Stonewort	AL	CHRO	77
1152	Chara zeylanica	Stonewort	AL	CHRO	135
1864	Nitella clavata	Stonewort	AL	CHRO	135
2222	Nitella sp	Stonewort	AL	CHRO	78
1954	Chilomonas marina	Cryptomonad	AL	CRYP	0
303	Chilomonas paramecium	Cryptomonad	AL	CRYP	11
334	Chroomonas salina	Cryptomonad	AL	CRYP	0
1913	Cryptomonas erosa	Cryptomonad	AL	CRYP	11
2140	Hemiselmis virescens	Cryptophyte	AL	CRYP	12
1896	Rhodomonas baltica	Cryptomonad	AL	CRYP	202
335	Rhodomonas lens	Cryptomonad	AL	CRYP	202
2105	Achnanthes brevipes	Diatom	AL	CRYS	14
1080	Achnanthes hauckiana	Diatom	AL	CRYS	144
1081	Achnanthes lanceolata dubia	Diatom	AL	CRYS	0
1732	Achnanthes linearis	Diatom	AL	CRYS	144
1226	Achnanthes sp	Diatom	AL	CRYS	14
2031	Amphiprora paludosa	Diatom	AL	CRYS	11
986	Amphiprora sp	Diatom	AL	CRYS	11
906	Amphora coffeaeformis	Diatom	AL	CRYS	14
1938	Amphora coffeaformis v. boreal	Diatom	AL	CRYS	136
2032	Amphora exigua	Diatom	AL	CRYS	59
1487	Amphora sp	Diatom	AL	CRYS	14

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1083	Anaulus balticus	Diatom	AL	CRYS	59
1963	Asterionella formosa	Diatom	AL	CRYS	14
1019	Asterionella japonica	Diatom	AL	CRYS	59
1244	Asterionella sp	Diatom	AL	CRYS	14
1682	Bacillariophyceae	Diatom Class	AL	CRYS	11
333	Bellerochea polymorpha	Diatom	AL	CRYS	0
1575	Bellerochea sp	Diatom	AL	CRYS	59
1959	Biddulphia sp	Diatom	AL	CRYS	14
2285	Chaetoceros affinis	Diatom	AL	CRYS	166
2069	Chaetoceros compressus	Diatom	AL	CRYS	59
2072	Chaetoceros curvisetus	Diatom	AL	CRYS	59
1897	Chaetoceros decipiens	Diatom	AL	CRYS	59
1898	Chaetoceros didymus	Diatom	AL	CRYS	59
1931	Chaetoceros galvestonensis	Diatom	AL	CRYS	59
2033	Chaetoceros neogracile	Diatom	AL	CRYS	59
2028	Chaetoceros simplex	Diatom	AL	CRYS	59
477	Chaetoceros socialis	Diatom	AL	CRYS	59
1948	Chrysophyta	Diatoms, Chrysophyte Division	AL	CRYS	11
1817	Coccolithus sp	Coccolithophorid	AL	CRYS	12
2061	Coscinodiscus gigas	Diatom	AL	CRYS	59
2060	Coscinodiscus granii	Diatom	AL	CRYS	59
669	Cricosphaera carterae	Coccolithophorid	AL	CRYS	12
2137	Cricosphaera elongata	Coccolithophorid	AL	CRYS	145
332	Cyclotella cryptica	Diatom	AL	CRYS	39
1479	Cyclotella meneghiniana	Diatom	AL	CRYS	11
2029	Cyclotella nana	Diatom	AL	CRYS	59
2027	Cyclotella sp	Diatom	AL	CRYS	59
636	Cylindrotheca closterium	Diatom	AL	CRYS	59
1930	Cylindrotheca sp	Diatom	AL	CRYS	12
1901	Detonula confervaceae	Diatom	AL	CRYS	59
1227	Diatoma sp	Diatom	AL	CRYS	14
1557	Diatoma vulgare	Diatom	AL	CRYS	14
1176	Dinobryon sp	Chrysophyte	AL	CRYS	11
591	Ditylum brightwelii	Diatom	AL	CRYS	39
325	Emiliania huxleyi	Coccolithophorid	AL	CRYS	62
1567	Fragilaria pinnata	Diatom	AL	CRYS	14
1957	Fragilaria sp	Diatom	AL	CRYS	14
1483	Gomphonema parvulum	Diatom	AL	CRYS	14
2025	Gyrosigma spencerii	Diatom	AL	CRYS	144
2284	Hymenomonas carterae	Biflagellate Coccolithid	AL	CRYS	62
326	Isochrysis galbana	Haptophyte	AL	CRYS	12
1869	Isochrysis sp	Haptophyte	AL	CRYS	12
526	Leptocylindrus sp	Diatom	AL	CRYS	59
437	Melosira granulta angustissima	Diatom	AL	CRYS	0
2161	Melosira varians	Diatom	AL	CRYS	14
329	Monallantus salina	Diatom	AL	CRYS	0
2014	Navicula arenaria	Diatom	AL	CRYS	9
2012	Navicula cryptocephala veneta	Diatom	AL	CRYS	9
2015	Navicula cryptocephala	Diatom	AL	CRYS	14
933	Navicula gracilis	Diatom	AL	CRYS	11
313	Navicula incerta	Diatom	AL	CRYS	12
2011	Navicula minima	Diatom	AL	CRYS	9
548	Navicula pelliculosa	Diatom	AL	CRYS	39

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2016	Navicula salinarum	Diatom	AL	CRYS	9
1082	Navicula salincola	Diatom	AL	CRYS	0
98	Navicula seminulum	Diatom	AL	CRYS	79
1814	Navicula sp	Diatom	AL	CRYS	11
1160	Navicula tripunctata	Diatom	AL	CRYS	9
2013	Navicula viridula	Diatom	AL	CRYS	9
1915	Nitzschia actinastroides	Diatom	AL	CRYS	79
2021	Nitzschia angularis affinis	Diatom	AL	CRYS	12
310	Nitzschia angularis	Diatom	AL	CRYS	179
1736	Nitzschia delicatissima	Diatom	AL	CRYS	79
2018	Nitzschia dissipata	Diatom	AL	CRYS	14
2019	Nitzschia dubiiformis	Diatom	AL	CRYS	0
2017	Nitzschia epiphytica	Diatom	AL	CRYS	79
2040	Nitzschia holsatica	Diatom	AL	CRYS	14
2022	Nitzschia liebethrutti	Diatom	AL	CRYS	0
9	Nitzschia linearis	Diatom	AL	CRYS	14
476	Nitzschia longissma	Diatom	AL	CRYS	79
1084	Nitzschia minutula	Diatom	AL	CRYS	67
1484	Nitzschia palea	Diatom	AL	CRYS	14
1085	Nitzschia perversa	Diatom	AL	CRYS	152
2023	Nitzschia sigma	Diatom	AL	CRYS	14
301	Nitzschia sp	Diatom	AL	CRYS	11
2020	Nitzschia thermalis	Diatom	AL	CRYS	79
438	Ochromonas vallesiaca	Chrysophyte	AL	CRYS	202
2037	Olisthodiscus sp	Golden Brown Algae	AL	CRYS	12
473	Pavlova lutheri	Haptophyte	AL	CRYS	62
1870	Pavlova sp	Haptophyte	AL	CRYS	62
1688	Phaeodactylum sp	Diatom	AL	CRYS	12
330	Phaeodactylum tricornutum	Diatom	AL	CRYS	12
1818	Pleurochrysis sp	Haptophyte	AL	CRYS	39
2104	Poteriochromonas malhamensis	Chrysophyte	AL	CRYS	12
2187	Prymnesium parvum	Marine Diatom	AL	CRYS	12
1502	Rhizoselenia hebetata f. semis	Diatom	AL	CRYS	179
1958	Schizonema sp	Diatom	AL	CRYS	39
309	Skeletonema costatum	Diatom	AL	CRYS	79
2106	Stauroneis amphoroides	Diatom	AL	CRYS	12
2024	Stauroneis constricta	Diatom	AL	CRYS	9
2026	Surirella ovata	Diatom	AL	CRYS	14
1966	Synedra sp	Diatom	AL	CRYS	14
305	Synura uvella	Chrysophyte	AL	CRYS	11
1921	Thalassiosira aestevalis	Diatom	AL	CRYS	0
331	Thalassiosira fluviatilis	Diatom	AL	CRYS	79
1899	Thalassiosira nordenskioeldii	Diatom	AL	CRYS	39
299	Thalassiosira pseudonana	Diatom	AL	CRYS	39
1900	Thalassiosira rotula	Diatom	AL	CRYS	0
2036	Thalassiosira sp	Diatom	AL	CRYS	12
2286	Tribonema sp	Xanthophyte	AL	CRYS	166
1808	Astasia longa	Flagellate Euglenoid	AL	EUGL	62
1473	Entosiphon sulcatum	Flagellate Euglenoid	AL	EUGL	11
1416	Euglena acus	Flagellate Euglenoid	AL	EUGL	11
430	Euglena gracilis	Flagellate Euglenoid	AL	EUGL	12
1815	Euglena sp	Flagellate Euglenoid	AL	EUGL	11
1689	Euglena viridis	Flagellate Euglenoid	AL	EUGL	12
1100	Ascophyllum nodosum	Brown Algae	AL	PHAE	41

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1101	Chorda filum	Brown Algae	AL	PHAE	41
1302	Ecklonia maxima	Kelp	AL	PHAE	37
1638	Ectocarpus siliculosus	Brown Algae	AL	PHAE	12
1961	Ectocarpus sp	Brown Algae	AL	PHAE	12
2288	Egregia laevigata	Brown Algae	AL	PHAE	106
1459	Fucus distichus	Brown Algae	AL	PHAE	42
1096	Fucus serratus	Toothed Wrack	AL	PHAE	131
2289	Fucus spiralis	Flat Wrack	AL	PHAE	131
1097	Fucus vesiculosus	Bladder Wrack	AL	PHAE	131
1960	Giffordia sp	Brown Algae	AL	PHAE	39
1983	Laminaria digitata	Brown Algae	AL	PHAE	41
2171	Laminaria hyperborea	Cuvie, Tangleweed	AL	PHAE	131
1099	Laminaria saccharina	Tangleweed, Brown Algae	AL	PHAE	131
2111	Macrocystis pyrifera	Brown Algae	AL	PHAE	106
2280	Pelvetia canaliculata	Channeled Wrack	AL	PHAE	131
2240	Sargassum filipendula	Sargassum Weed	AL	PHAE	41
2235	Sargassum fluitans	Sargassum Weed	AL	PHAE	41
1167	Sargassum sp	Sargassum Weed	AL	PHAE	41
1488	Scytosiphon lomentaria	Brown Algae	AL	PHAE	41
336	Amphidinium carterae	Dinoflagellate	AL	PYRR	12
930	Amphidinium klebsii	Dinoflagellate	AL	PYRR	11
1964	Ceratium hirundinella	Dinoflagellate	AL	PYRR	11
1177	Ceratium sp	Dinoflagellate	AL	PYRR	11
1474	Exuviaella baltica	Dinoflagellate	AL	PYRR	118
1180	Glenodinium sp	Dinoflagellate	AL	PYRR	11
2283	Gonyaulax polyedra	Dinoflagellate	AL	PYRR	166
1944	Gonyaulax tamarensis	Dinoflagellate	AL	PYRR	39
151	Gymnodinium breve	Dinoflagellate	AL	PYRR	39
931	Gymnodinium microadriatricum	Golden-Brown Algae	AL	PYRR	0
672	Gymnodinium splendens	Dinoflagellate	AL	PYRR	12
1923	Gyrodinium sp	Dinoflagellate	AL	PYRR	11
551	Olisthodiscus luteus	Dinoflagellate	AL	PYRR	12
671	Prorocentrum micans	Dinoflagellate	AL	PYRR	97
1979	Pyrrophyta	Dinoflagellate Algae Division	AL	PYRR	47
670	Scrippsiella faeroense	Dinoflagellate	AL	PYRR	118
1953	Batrachospermum sp	Red Algae	AL	RHOD	11
1490	Callithamnion corymbosum	Red Algae	AL	RHOD	12
1103	Chondrus crispus	Irish Moss,Carageen, Red Algae	AL	RHOD	131
2149	Corallina officinalis	Coralline Or Red Algae	AL	RHOD	131
1305	Gigartina radula	Red Algae	AL	RHOD	37
1102	Gigartina stellata	Red Algae	AL	RHOD	41
1303	Porphyra capensis	Red Algae, Purple Laver	AL	RHOD	37
1156	Porphyra leucosticta	Red Algae	AL	RHOD	11
2287	Porphyra tenera	Red Algae	AL	RHOD	106
1737	Porphyra yezoensis	Red Algae	AL	RHOD	125
1894	Porphyridium aerugineum	Red Algae	AL	RHOD	12
314	Porphyridium cruentum	Red Algae	AL	RHOD	11
1908	Porphyridium sp	Red Algae	AL	RHOD	11
1104	Rhodymenia palmata	Dulse Or Red Algae	AL	RHOD	131
1802	Rhodymenia pseudopalmata	Red Algae	AL	RHOD	12
1304	Suhria vittata	Red Algae	AL	RHOD	106

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1893	Botrydium becherianum	Xanthophyte, Yellow-Greens	AL	XANT	12
1887	Bumilleria exilis	Xanthophyte, Yellow-Greens	AL	XANT	11
1937	Bumilleriopsis filiformis	Xanthophyte, Yellow-Greens	AL	XANT	62
1862	Characiopsis sp	Xanthophyte, Yellow-Greens	AL	XANT	11
1976	Tribonema inequale	Xanthophyte, Yellow-Greens	AL	XANT	44
1241	Fissidens crassipes	Moss	BY	MUSC	64
1243	Fontinalis antipyretica	Moss	BY	MUSC	64
1239	Leptodictyum riparium	Moss	BY	MUSC	64
1240	Leskea polycarpa	Moss	BY	MUSC	64
1935	Salvinia natans	Floating Moss	BY	MUSC	77
2223	Agrostis palustris	Creeping Bentgrass	TR	TRAC	18
2245	Alisma	Water Plantain	TR	TRAC	18
659	Alternanthera philoxeroides	Alligator-Weed	TR	TRAC	18
1352	Azolla sp	Water Fern	TR	TRAC	18
1408	Cabomba caroliniana	Fanwort	TR	TRAC	18
2244	Callitriche stagnalis	Macrophyte	TR	TRAC	153
508	Ceratophyllum demersum	Coon-Tail	TR	TRAC	18
1761	Ceratophyllum sp	Coon-Tail	TR	TRAC	18
878	Ceratopteris thalictroides	Floating Fern	TR	TRAC	18
456	Cladium jamaicense	Saw-Grass	TR	TRAC	18
2228	Digitaria sp	Crabgrass	TR	TRAC	18
1078	Distichlis spicata	Saltgrass	TR	TRAC	18
1358	Echinochloa crusgalli	Barnyard Grass	TR	TRAC	18
655	Egeria densa	American Frog's-Bit	TR	TRAC	18
658	Eichhornia crassipes	Water-Hyacinth	TR	TRAC	18
2219	Eleocharis macrostachya	Creeping Spike Rush	TR	TRAC	18
909	Elodea canadensis	Waterweed	TR	TRAC	18
1916	Elodea densa	Waterweed	TR	TRAC	77
656	Elodea sp	Waterweed	TR	TRAC	18
1952	Glyceria dibranchiata	Manna-Grass	TR	TRAC	0
911	Groenlandia densa	Pondweed	TR	TRAC	153
1994	Heteranthera sp	Mud-Plantain	TR	TRAC	18
1413	Hydrilla sp	Hydrilla	TR	TRAC	153
1206	Hydrilla verticillata	Hydrilla	TR	TRAC	153
1943	Hygrophila lacustris	Aquatic Plant	TR	TRAC	18
1674	Juncus sp	Bog-Rush	TR	TRAC	18
1649	Justicia americana	American Water-Willow	TR	TRAC	18
1799	Lemna gibba	Inflated Duckweed	TR	TRAC	18
507	Lemna minor	Duckweed	TR	TRAC	18
1593	Lemna perpusilla	Duckweed	TR	TRAC	36
1407	Lemna sp	Duckweed	TR	TRAC	18
2220	Ludwigia palustris	Water Primrose	TR	TRAC	78
1806	Ludwigia sp	Water-Primrose	TR	TRAC	18
961	Myriophyllum alterniflorum	Water-Milfoil	TR	TRAC	77
978	Myriophyllum brasiliense	Parrot's-Feather	TR	TRAC	18
2127	Myriophyllum exalbescens	American Milfoil	TR	TRAC	18
1087	Myriophyllum spicatum	Water-Milfoil	TR	TRAC	18
504	Myriophyllum sp	Water-Milfoil	TR	TRAC	18
1409	Najas flexilis	Slender Water-Nymph	TR	TRAC	18

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1328	Najas guadalupensis	Common Water-Nymph	TR	TRAC	18
2218	Najas sp	Water Nymph	TR	TRAC	78
1326	Nelumbo lutea	Yellow Lotus	TR	TRAC	18
984	Nuphar sp	Yellow Cowlily, Spatterdock	TR	TRAC	18
1598	Phragmites communis	Common Reed	TR	TRAC	18
1530	Polygonum muhlenbergii	Smartweed	TR	TRAC	77
457	Pontederia lanceolata	Pickerel-Weed	TR	TRAC	18
2224	Posidonia oceania	Aquatic Plant	TR	TRAC	18
502	Potamogeton crispus	Curled Pondweed	TR	TRAC	18
503	Potamogeton foliosus	Pondweed	TR	TRAC	18
910	Potamogeton illinoensis	Pondweed	TR	TRAC	18
2221	Potamogeton natans	Pondweed	TR	TRAC	78
1324	Potamogeton nodosus	Pondweed	TR	TRAC	18
501	Potamogeton pectinatus	Sago Pondweed	TR	TRAC	18
1282	Potamogeton perfoliatus	Pondweed	TR	TRAC	77
1865	Potamogeton pusillus	Pondweed	TR	TRAC	18
1993	Potamogeton sp	Pondweed	TR	TRAC	18
1088	Potamogeton zosteriformis	Pondweed	TR	TRAC	77
960	Ranunculus penicillatus	Buttercup	TR	TRAC	153
1281	Ruppia maritima	Widgeon-Grass	TR	TRAC	18
1327	Sagittaria montevidensis	Arrowhead	TR	TRAC	18
2246	Sagittaria sp	Arrowhead	TR	TRAC	18
1940	Salix sp	Willow	TR	TRAC	18
1411	Salvinia sp	Floating Moss	TR	TRAC	18
506	Scirpus validus	Soft-Stem Bulrush	TR	TRAC	18
1153	Smartweed	Smartweed	TR	TRAC	99
505	Sparganium eurycarpum	Bur-Reed	TR	TRAC	18
1390	Spartina alterniflora	Smooth Cordgrass	TR	TRAC	18
907	Spartina cynosuroides	Big Cordgrass	TR	TRAC	18
2099	Spirodela oligorhiza	Big Duckweed	TR	TRAC	18
1592	Spirodela polyrhiza	Large Duckweed	TR	TRAC	36
1448	Thalassia testudinum	Turtle-Grass	TR	TRAC	18
2095	Tracheophyta	Vascular Plants	TR	TRAC	99
1941	Typha sp	Cat-Tail	TR	TRAC	18
1410	Utricularia sp	Bladderwort	TR	TRAC	18
510	Utricularia vulgaris	Common Bladderwort	TR	TRAC	18
1596	Vallisneria americana	Water-Celery, Tapegrass	TR	TRAC	18
1412	Vallisneria sp	Water-Celery, Tapegrass	TR	TRAC	18
1680	Wolffia papulifera	Water-Meal	TR	TRAC	18
1863	Zannichellia palustris	Common Poolmat	TR	TRAC	18
1616	Zostera marina	Eelgrass	TR	TRAC	78
2260	Candida lipolytica	Fungi	FU	FUNG	61
2207	Cephalosporium sp	Fungi	FU	FUNG	96
181	Cladosporium sp	Fungus	FU	FUNG	96
2261	Pichia spartinae	Fungi	FU	FUNG	61
2208	Saccharomyces sp	Fungi	FU	FUNG	96
993	Geodia cydonium	Sponge	PO	PORI	24
2152	Grantia compressa	Sponge	PO	PORI	105
2150	Halichondria panicea	Sponge	PO	PORI	3
2151	Hymeniacidon perleve	Sponge	PO	PORI	105
1469	Spongilla lacustris	Freshwater Sponge	PO	PORI	10
2176	Actinia equina	Sea Anemone	CN	CNID	24
2256	Aiptasia pallida	Sea Anemone	CN	CNID	157

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2153	Anemonia sulcata	Sea Anemone	CN	CNID	38
121	Campanularis flexuosa	Hydroid	CN	CNID	70
1343	Cnidaria	Coelenterate Phylum	CN	CNID	3
1245	Hydra attenuata	Hydra	CN	CNID	117
1942	Hydra littoralis	Hydra	CN	CNID	10
381	Hydra sp	Hydra	CN	CNID	10
443	Phialidium sp	Jellyfish	CN	CNID	3
442	Pleurobrachia pileus	Comb-Jelly	CT	CTEN	3
941	Adenorhynchus sp	Turbellarian	PL	TURB	134
938	Archiloa cf wilsoni	Turbellarian	PL	TURB	209
942	Archimonotresis sp	Turbellarian	PL	TURB	134
1159	Catenula sp	Turbellarian, Flatworm	PL	TURB	10
937	Convoluta sp	Turbellarian	PL	TURB	24
1278	Crenobia alpina	Turbellarian, Flatworm	PL	TURB	170
209	Dugesia dorotocephala	Turbellarian, Flatworm	PL	TURB	170
1350	Dugesia gonocephala	Turbellarian, Planarian	PL	TURB	170
2051	Dugesia lugubris	Turbellarian, Planarian	PL	TURB	170
757	Dugesia sp	Turbellarian, Flatworm	PL	TURB	170
531	Dugesia tigrina	Turbellarian, Flatworm	PL	TURB	170
957	Labidognathia longicolis	Gnathostomulid Turbellarian	PL	TURB	134
936	Macrostomum sp	Turbellarian, Flatworm	PL	TURB	10
1563	Mesostoma ehrenbergi	Turbellarian, Flatworm	PL	TURB	10
943	Myopea crassula	Turbellarian	PL	TURB	6
762	Phagocata gracilis	Turbellarian, Flatworm	PL	TURB	170
1781	Planaria sp	Planarian, Flatworm	PL	TURB	170
1986	Polycelis felina	Turbellarian	PL	TURB	170
939	Prognathorhynchus sp	Turbellarian	PL	TURB	209
945	Proseriata	Turbellarian Suborder	PL	TURB	203
944	Pseudohaplogonaria sp	Turbellarian	PL	TURB	134
1872	Rhabdocoela	Flatworm Order	PL	TURB	184
940	Solenofilmorpha funilis	Turbellarian	PL	TURB	6
1757	Turbellaria	Flatworm Class	PL	TURB	47
958	Austrognathia christianne	Gnathostomulid	GN	GNAT	208
956	Gnathostomula microstyle	Gnathostomulid	GN	GNAT	52
955	Gnathostomula tuckeri	Gnasthostomulid	GN	GNAT	208
1439	Cerebratulus sp	Proboscis Worm, Nemertean	NE	NEME	38
775	Nemertea sp	Proboscis Worm, Nemertean	NE	NEME	38
1456	Anoplostoma sp	Nematode	NM	NEMA	159
1650	Axonolaimus paraponticus	Nematode	NM	NEMA	220
865	Chromadora nudicapitata	Nematode	NM	NEMA	139
1208	Chromadorina germanica	Nematode	NM	NEMA	222
682	Chromadorita sp	Nematode	NM	NEMA	47
1219	Cyatholaimus sp	Nematode	NM	NEMA	94
694	Diplolaimella punicea	Nematode	NM	NEMA	0
920	Diplolaimelloides delyi	Nematode	NM	NEMA	0
1108	Eleutherolaimus stenosoma	Nematode	NM	NEMA	0
959	Eubostrichus dianeae	Nematode	NM	NEMA	221
1423	Eurystomia sp	Nematode	NM	NEMA	50
1283	Microlaimus problematicus	Nematode	NM	NEMA	0
1353	Monhystera sp	Nematode	NM	NEMA	50
1161	Nematoda	Nematode Phylum	NM	NEMA	10

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1025	Neonyx sp	Nematode	NM	NEMA	0
1117	Oncholaimus domesticus	Nematode	NM	NEMA	0
1975	Oncholaimus macramphida	Nematode	NM	NEMA	50
1925	Prochromadorella micoletzkyi	Nematode	NM	NEMA	0
1782	Turbatrix sp	Vinegar Eel	NM	NEMA	38
954	Dolichodasys carolinensis	Gastrotrich	GS	GAST	0
952	Macrodasys sp	Gastrotrich	GS	GAST	94
951	Neodasys sp	Gastrotrich	GS	GAST	3
953	Turbanella c.f. mustela	Gastrotrich	GS	GAST	0
1810	Asplanchna brightwelli	Rotifer	RO	ROTI	47
1389	Asplanchna sp	Rotifer	RO	ROTI	47
631	Brachionus angularis	Rotifer	RO	ROTI	47
1746	Brachionus bidentata	Rotifer	RO	ROTI	47
1744	Brachionus budapestinensis	Rotifer	RO	ROTI	55
1747	Brachionus calyciflorus	Rotifer	RO	ROTI	47
1854	Brachionus falcatus	Rotifer	RO	ROTI	55
345	Brachionus plicatilis	Rotifer	RO	ROTI	47
1743	Brachionus quadridentata	Rotifer	RO	ROTI	47
1205	Brachionus sp	Rotifer	RO	ROTI	47
1745	Brachionus urceolaris	Rotifer	RO	ROTI	10
1751	Epiphanes brachionus	Rotifer	RO	ROTI	47
1750	Filinia terminalis	Rotifer	RO	ROTI	47
1749	Hexarthra intermedia	Rotifer	RO	ROTI	55
632	Keratella americana	Rotifer	RO	ROTI	47
30	Keratella cochlearis	Rotifer	RO	ROTI	47
1752	Keratella sp	Rotifer	RO	ROTI	47
1360	Lecane sp	Rotifer	RO	ROTI	47
1364	Lepadella sp	Rotifer	RO	ROTI	47
1362	Monostyla quadridentata	Rotifer	RO	ROTI	47
1361	Monostyla sp	Rotifer	RO	ROTI	47
114	Philodina acuticornis	Rotifer	RO	ROTI	176
231	Philodina roseola	Rotifer	RO	ROTI	47
1547	Philodina sp	Rotifer	RO	ROTI	47
1363	Platyias quadricornis	Rotifer	RO	ROTI	47
1748	Polyarthra trigla	Rotifer	RO	ROTI	47
148	Rotifera	Rotifer Phylum	RO	ROTI	47
1365	Testudinella patina	Rotifer	RO	ROTI	47
1965	Tetramastix sp	Rotifer	RO	ROTI	47
1119	Nematomorpha	Horsehair Worm Phylum	NT	NEMT	38
1250	Erpobdella octoculata	Leech	AN	HIRU	34
512	Erpobdella punctata	Red Leech	AN	HIRU	34
534	Erpobdellidae	Fresh-Water Leech Family	AN	HIRU	10
947	Glossiphonia complanata	Leech	AN	HIRU	34
1566	Haemopis sanguisuga	Horse Leech	AN	HIRU	56
948	Helobdella stagnalis	Leech	AN	HIRU	34
1120	Hirudinea	Leech Class	AN	HIRU	10
1095	Hirudo nipponia	Asian Leech	AN	HIRU	211
2205	Nephelopsis obscura	Leech	AN	HIRU	47
1569	Aeolosoma headleyi	Oligochaete	AN	OLIG	10
1548	Aulophorus sp	Oligochaete	AN	OLIG	10
1186	Branchiura sowerbyi	Oligochaete	AN	OLIG	10
1565	Chaetogaster diaphanus	Oligochaete	AN	OLIG	10
1166	Dero limosa	Oligochaete	AN	OLIG	10
1246	Dero obtusa	Oligochaete	AN	OLIG	10

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1499	Enchytraeus albidus	Potworm	AN	OLIG	69
233	Limnodrilus hoffmeisteri	Oligochaete	AN	OLIG	123
1059	Limnodrilus udekemianus	Oligochaete	AN	OLIG	123
625	Lumbricidae	Oligochaete Family	AN	OLIG	10
533	Lumbriculus inconstans	Oligochaete	AN	OLIG	10
640	Lumbriculus variegatus	Oligochaete	AN	OLIG	10
1630	Naididae	Oligochaete Family	AN	OLIG	10
115	Nais sp	Oligochaete	AN	OLIG	10
927	Nais variabilis	Oligochaete	AN	OLIG	10
975	Oligochaeta	Annelid Worm Class	AN	OLIG	10
1376	Rhynchelmis sp	Oligochaete	AN	OLIG	123
1564	Stylaria lacustris	Oligochaete	AN	OLIG	10
1137	Tubifex sp	Tubificid Worm	AN	OLIG	10
532	Tubifex tubifex	Tubificid Worm	AN	OLIG	10
869	Tubificidae	Oligochaete Family	AN	OLIG	10
853	Arenicola cristata	Lugworm	AN	POLY	3
747	Arenicola marina	Lugworm	AN	POLY	131
886	Capitella capitata	Polychaete	AN	POLY	3
1022	Ctenodrilus serratus	Polychaete	AN	POLY	69
2054	Dinophilus sp	Bristle Worm	AN	POLY	3
1980	Eudistylia vancouveri	Polycheate	AN	POLY	69
1523	Eulalia sp	Polychaete	AN	POLY	3
881	Haploscoloplos foliosus	Polychaete	AN	POLY	0
1694	Lanice conchilega	Polychaete	AN	POLY	105
2211	Lepidonotus squamatus	Polychaete	AN	POLY	3
1812	Myxicola infundibulum	Polychaete	AN	POLY	3
2290	Neanthes grubei	Polychaete	AN	POLY	69
2082	Neanthes vaali	Polychaete, Bristle Worm	AN	POLY	51
833	Nepthys cirrosa	Polychaete	AN	POLY	105
834	Nepthys hombergi	Polychaete	AN	POLY	105
224	Nereis arenaceodentata	Polychaete	AN	POLY	3
744	Nereis diversicolor	Polychaete	AN	POLY	3
394	Nereis glandicincta	Polychaete	AN	POLY	0
1356	Nereis limnicola	Polychaete	AN	POLY	30
1457	Nereis sp	Polychaete Or Rag Worm	AN	POLY	131
2188	Nereis succinea	Polychaete	AN	POLY	3
58	Nereis virens	Polychaete	AN	POLY	3
653	Ophryotrocha diadema	Polychaete	AN	POLY	0
1570	Ophryotrocha labronica	Polychaete	AN	POLY	211
841	Owenia fusiformis	Polychaete	AN	POLY	3
835	Pectinaria koreni	Polychaete	AN	POLY	105
1279	Phyllodoce maculata	Polychaete	AN	POLY	3
1438	Polychaeta	Polychaete, Annelid Class	AN	POLY	3
773	Polydora ligni	Polychaete	AN	POLY	3
2206	Polydora sp	Polychaete	AN	POLY	3
716	Scolelepis fuliginosa	Spionid Polychaete	AN	POLY	105
840	Scolelepis squamata	Spionid Polychaete	AN	POLY	3
774	Spiophanes bombyx	Spionid Polychaete	AN	POLY	3
2251	Stauronereis rudolphi	Polychaete	AN	POLY	51
2167	Brachiopoda	Lamp Shell Phylum	BC	BRAC	3
447	Lepidochitona cinerea	Chiton	ML	AMPN	24
363	Loligo pealei	Squid	ML	CEPH	3
1708	Octopus bimaculatus	Octopus	ML	CEPH	75
2212	Acmaea testudinalis	Limpet	ML	GASR	3

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
116	Amnicola sp	Spire Snail	ML	GASR	189
348	Amplexa hypnorum	Bladder Snail	ML	GASR	10
926	Ancylus fluviatilis	River Limpet	ML	GASR	58
2100	Ancylus sp	Fresh-Water Limpet	ML	GASR	38
2213	Aporrhais pespelecani	Pelican's Foot	ML	GASR	24
610	Australorbis glabratus	Snail	ML	GASR	183
1201	Australorbis sp	Snail	ML	GASR	183
494	Biomphalaria alexandrina	Snail	ML	GASR	156
577	Biomphalaria glabrata	Snail	ML	GASR	156
1668	Biomphalaria sp	Snail	ML	GASR	101
567	Bithynia tentaculata	Snail	ML	GASR	10
988	Buccinum undatum	Large Whelk	ML	GASR	131
2247	Bulinus tropicus	Snail	ML	GASR	156
495	Bulinus truncatus	Snail	ML	GASR	156
2128	Bulla digitalis	Gastropod	ML	GASR	0
1918	Busycon canaliculatum	Whelk	ML	GASR	3
235	Campeloma decisum	Brown Mystery Snail	ML	GASR	189
1981	Campeloma sp	Mystery Snail	ML	GASR	189
2165	Cepaea nemoralis	Snail	ML	GASR	98
395	Cerithidea cingulata	Horn Shell	ML	GASR	17
2267	Cipangopaludina chinensis	Oriental Mystery Snail	ML	GASR	189
705	Cipangopaludina japonica	Mud Snail	ML	GASR	17
199	Cipangopaludina malleata	Mud Snail	ML	GASR	17
1868	Crepidula fornicata	Slipper Limpet	ML	GASR	131
1142	Eubranchus pallida	Nudibranch, Painted Aeoli	ML	GASR	195
1125	Gastropoda	Snails, Limpets Class	ML	GASR	10
2155	Gibbula cineraria	Grey Topshell	ML	GASR	131
594	Gibbula umbilicalis	Flat Topshell	ML	GASR	131
496	Goniobasis livescens	River Snail	ML	GASR	10
474	Goniobasis sp	Snail	ML	GASR	10
236	Gyraulus circumstriatus	Flatly Coiled Gyraulus	ML	GASR	189
1641	Haliotis cracherodii	Black Abalone	ML	GASR	75
1571	Haliotis rufescens	Red Abalone	ML	GASR	75
1795	Helisoma anceps	Ramshorn Snail	ML	GASR	0
1504	Helisoma campanulata	Ramshorn Snail	ML	GASR	101
413	Helisoma sp	Ramshorn Snail	ML	GASR	10
1610	Helisoma trivolvis	Ramshorn Snail	ML	GASR	10
2249	Hydrobia ulvae	Mud Snail	ML	GASR	131
697	Indoplanorbis exustus	Snail	ML	GASR	156
818	Lambis lambis	Common Spider Conch	ML	GASR	86
1391	Littorina irrorata	Marsh Periwinkle	ML	GASR	86
2248	Littorina littoralis	Flatwinkle Or Periwinkle	ML	GASR	22
595	Littorina littorea	Common Or Edible Winkle	ML	GASR	22
1919	Littorina obtusata	Round Periwinkle	ML	GASR	131
2156	Littorina saxatilis	Rough Periwinkle	ML	GASR	131
1640	Lymnaea acuminata	Pond Snail	ML	GASR	184
2172	Lymnaea emarginata	Pond Snail	ML	GASR	101
719	Lymnaea emarginata angulata	Pond Snail	ML	GASR	26
405	Lymnaea luteola	Pond Snail	ML	GASR	184
2250	Lymnaea natalensis	Pond Snail	ML	GASR	156
565	Lymnaea ovata	Wandering Pond Snail	ML	GASR	195
237	Lymnaea palustris	Marsh Snail	ML	GASR	58

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1249	Lymnaea peregra	Wandering Snail	ML	GASR	58
709	Lymnaea rubignosa	Pond Snail	ML	GASR	0
1043	Lymnaea sp	Pond Snail	ML	GASR	10
294	Lymnaea stagnalis	Great Pond Snail	ML	GASR	58
1131	Lymnaea trunculata	Dwarf Pond Snail	ML	GASR	58
903	Marisa cornuarietes	Snail	ML	GASR	156
1041	Melampus bidentatus	Salt Marsh Snail	ML	GASR	3
2229	Monodonta articulata	Top Shell	ML	GASR	195
1003	Monodonta turbinata	Snail	ML	GASR	24
306	Murex brandaris	Murex	ML	GASR	24
492	Nassarius obsoletus	Eastern Mud Snail	ML	GASR	86
1578	Nitocris sp	Snail	ML	GASR	10
1771	Nucella lapillus	Dow Whelk, Atlantic Dogwinkle	ML	GASR	75
1441	Ogleija diomeda	Opistobranch	ML	GASR	0
2123	Onchidoris fusca	Sea Slug, Nudibranch	ML	GASR	3
654	Oncomelania nosophora	Snail	ML	GASR	22
752	Oxytrema catenaria	River Horn Snail	ML	GASR	0
1707	Patella caerulea	Blue Limpet	ML	GASR	195
2030	Patella sp	Limpet	ML	GASR	22
2154	Patella vulgata	Common Limpet, Flither	ML	GASR	131
899	Physa acuta	Bladder Snail	ML	GASR	58
1911	Physa acutadina malleata	Pouch Snail	ML	GASR	0
564	Physa fontinalis	Bladder Snail	ML	GASR	58
117	Physa gyrina	Pouch Snail	ML	GASR	10
239	Physa integra	Pouch Snail	ML	GASR	10
29	Physa sp	Pouch Snail	ML	GASR	10
1405	Physa virgata	Snail	ML	GASR	0
1933	Physella elliptica	Snail	ML	GASR	101
111	Physella heterostropha	Snail	ML	GASR	101
1509	Physidae	Pouch Snail Family	ML	GASR	10
634	Pila globosa	Apple Snail	ML	GASR	184
1057	Planorbarius sp	Ramshorn Snail	ML	GASR	24
1404	Planorbella tenui	Snail	ML	GASR	0
514	Planorbidae	Orb Snail Family	ML	GASR	10
905	Planorbis corneus	Great Ramshorn Snail	ML	GASR	58
569	Planorbis planorbis	Ramshorn Snail	ML	GASR	58
568	Planorbis vortex	Whirlpool Ramshorn Snail	ML	GASR	58
545	Pleurocera sp	River Snail	ML	GASR	10
770	Polinices lacteus	Milk Moon Shell	ML	GASR	75
596	Purpura lapillus	Snail	ML	GASR	24
898	Semisulcospira libertina	Marsh Snail	ML	GASR	104
1644	Tegula brunnea	Brown Turban Snail	ML	GASR	75
1112	Thais clavigera	Snail	ML	GASR	0
2268	Thais lapillus	Atlantic Dogwinkle	ML	GASR	75
2089	Urosalpinx cinereus	Atlantic Coast Oyster Drill	ML	GASR	3
1444	Vivaparus bengalensis	Snail	ML	GASR	184
1698	Viviparus georgianus	Banded Mystery Snail	ML	GASR	189
297	Viviparus sp	River Snail	ML	GASR	131
566	Viviparus viviparus	River Snail	ML	GASR	58
769	Abra aequalis	Common Atlantic Abra	ML	PELE	3
1710	Aequipecten irradians	Bay Scallop	ML	PELE	3
1657	Aequipecten opercularis	Queen Scallop	ML	PELE	98

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1790	Anadara broughtoni	Ark Shell	ML	PELE	151
1787	Anadara granosa	Ark Shell	ML	PELE	86
576	Anodonta cataracta	Floater	ML	PELE	101
570	Anodonta complanata	Fresh-Water Mussel	ML	PELE	63
480	Anodonta cygnea	Swan Mussel	ML	PELE	131
414	Anodonta grandis	Floater, Mussel	ML	PELE	101
232	Anodonta piscinalis	Fresh-Water Mussel	ML	PELE	63
985	Anodonta sp	Fresh-Water Mussel	ML	PELE	10
2214	Anomia ephippium	False Saddle Oyster	ML	PELE	24
950	Arctica islandica	Ocean Quahog	ML	PELE	75
710	Argopecten irradians	Bay Scallop	ML	PELE	75
1277	Brachidontes recurves	Hooked Mussel	ML	PELE	3
2042	Brachidontes variabilis	Variable Mussel	ML	PELE	112
12	Cerastoderma edule	Cockle	ML	PELE	75
1002	Cerastoderma glaucum	Cockle	ML	PELE	86
1576	Cerastoderma glaucum	Cockle	ML	PELE	86
831	Chlamys asperrima	Prickly Scallop	ML	PELE	86
1001	Chlamys opercularis	Scallop	ML	PELE	24
1292	Choromytilus meridionalis	Black Mussel	ML	PELE	150
1706	Clinocardium nuttallii	Cockle	ML	PELE	75
1626	Clinocardium sp	White Cockle	ML	PELE	75
1497	Congeria leucopheata	False Mussel	ML	PELE	3
1618	Corbicula fluminea	Asiatic Clam	ML	PELE	38
729	Corbicula leana	Clam	ML	PELE	17
215	Corbicula manilensis	Asiatic Clam	ML	PELE	75
924	Corbicula sp	Clam	ML	PELE	75
1777	Crassostrea angulata	Portugese Oyster	ML	PELE	75
2136	Crassostrea cucullata	Oyster	ML	PELE	0
575	Crassostrea gigas	Pacific Oyster	ML	PELE	3
1786	Crassostrea madrasensis	Oyster	ML	PELE	0
723	Crassostrea rhizophorae	Mangrove Oyster	ML	PELE	75
67	Crassostrea virginica	American Or Virginia Oyster	ML	PELE	3
1192	Donax cuneatus	Marine Bivalve	ML	PELE	0
1671	Donax faba	Clam	ML	PELE	7
1298	Donax serra	White Sand Mussel	ML	PELE	0
2043	Donax trunculus	Clam	ML	PELE	24
2053	Donax variabilis texasiana	Coquina	ML	PELE	75
218	Dreissena polymorpha	Zebra Mussel	ML	PELE	24
754	Elliptio buckleyi	Fresh-Water Mussel	ML	PELE	0
667	Elliptio complanata	Mussel, Eastern Elliptio	ML	PELE	189
2057	Elliptio crassidens	Mussel	ML	PELE	101
415	Elliptio dilatatus	Bivalve	ML	PELE	101
1209	Elliptio sp	Fresh-Water Mussel	ML	PELE	10
768	Ensis minor	Jackknife Clam	ML	PELE	75
809	Glebula rotundata	Bivalve	ML	PELE	10
2269	Glycymeris yessoensis	Bittersweet	ML	PELE	17
1110	Haliotis gigantea	Abalone	ML	PELE	98
1299	Haliotis midae	Abalone	ML	PELE	86
2215	Hiatella arctica	Red Nose Or Arctic Saxicave	ML	PELE	3
824	Hippopus hippopus	Clam	ML	PELE	24
1193	Indonaia caerulea	Unionid Clam	ML	PELE	184
1191	Katelysia opima	Marine Bivalve	ML	PELE	0

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
635	Lamellidens marginalis	Mussel	ML	PELE	184
403	Lampsilis radiata	Lamp-Mussel	ML	PELE	101
374	Lampsilis siliquoidea	Lamp-Mussel	ML	PELE	10
599	Ligumia sp	Fresh-Water Mussel	ML	PELE	10
304	Macoma balthica	Balthica Macoma Or Clam	ML	PELE	75
739	Macoma inquinata	Bent-Nosed Clam	ML	PELE	75
401	Macoma nasuta	Bent-Nosed Clam	ML	PELE	98
1179	Magnonaias boykiniana	Clam	ML	PELE	0
2052	Mercenaria campechiensis	Southern Quahog	ML	PELE	75
55	Mercenaria mercenaria	Northern Quahog Or Hard Clam	ML	PELE	75
1788	Meretrix casta	Clam	ML	PELE	0
1791	Meretrix lusoria	Clam	ML	PELE	151
1622	Modiolus demissus	Ribbed Mussel	ML	PELE	3
1924	Modiolus demissus granosissima	Ribbed Mussel	ML	PELE	108
989	Modiolus modiolus	Horse Mussel	ML	PELE	131
879	Mollusca	Mollusk Phylum	ML	PELE	3
349	Mya arenaria	Sand Gaper, Soft Shell Clam	ML	PELE	131
420	Mytilus californianus	Mussel	ML	PELE	75
2083	Mytilus edulis planulatus	Mussel	ML	PELE	150
208	Mytilus edulis	Common Bay Mussel, Blue Mussel	ML	PELE	131
385	Mytilus galloprovincialis	Mediterranean Mussel	ML	PELE	24
832	Mytilus sp	Mussel	ML	PELE	75
2084	Neotrigonia margaritacea	Bivalve	ML	PELE	24
1678	Notocallista sp	Bivalve	ML	PELE	0
828	Ostrea angasi	Oyster	ML	PELE	223
344	Ostrea edulis	Flat, Native European Oyster	ML	PELE	131
1704	Ostrea lurida	Pacific Oyster	ML	PELE	75
856	Ostrea sinuata	Oyster	ML	PELE	0
1197	Ostrea virginica	Virginia Oyster	ML	PELE	98
830	Pecten fumatus	Scallop	ML	PELE	0
990	Pecten maximus	Great Scallop	ML	PELE	86
855	Pecten novaezelandiae	Scallop	ML	PELE	86
1111	Pecten yessoensis	Scallop	ML	PELE	86
1225	Pelecypoda	Bivalve, Clam, Mussel Class	ML	PELE	10
586	Perna viridis	Green Mussel	ML	PELE	86
827	Pinctada margaritiferus	Pearl Oyster	ML	PELE	75
1336	Pisidium castertanum	Pea Cockle	ML	PELE	131
600	Pisidium sp	Pea Cockle	ML	PELE	131
1775	Plectomerus sp	Mussel	ML	PELE	10
738	Protothaca staminea	Littleneck Clam	ML	PELE	75
1603	Quadrula pustulosa	Warty-Back, Bivalve	ML	PELE	189
522	Rangia cuneata	Common Rangia Or Clam	ML	PELE	75
829	Saccostrea commercialis	Rock Oyster	ML	PELE	169
823	Saccostrea sp	Rock Oyster	ML	PELE	169
1702	Saxidomus gigantea	Butter Clam	ML	PELE	75
590	Scrobicularia plana	Bivalve	ML	PELE	24
1705	Siliqua patula	Razor Clam	ML	PELE	75
245	Sphaerium corneum	European Fingernail Clam	ML	PELE	189

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
601	Sphaerium sp	Orb Cockle, Fingernail Clam	ML	PELE	131
637	Sphaerium transversum	Long Fingernail Clam	ML	PELE	29
1703	Tapes japonica	Manilla Littleneck Clam	ML	PELE	151
1109	Tapes philippinarum	Japanese Littleneck Clam	ML	PELE	75
462	Tapes semidecussata	Manilla Clam	ML	PELE	75
895	Tresus capax	Horse Clam	ML	PELE	75
1214	Tresus sp	Horse Clam	ML	PELE	75
826	Tridacna derasa	Clam	ML	PELE	86
825	Tridacna maxima	Clam	ML	PELE	24
234	Unio pictorum	Mussel	ML	PELE	24
244	Unio tumidus	Mussel	ML	PELE	63
1785	Villorita cyprinoides	Bivalve	ML	PELE	0
1234	Acarina sp	Arachnid	AR	ARAC	0
373	Argyroneta aquatica	Water Spider	AR	ARAC	10
323	Arrenurus globator	Water Mite	AR	ARAC	196
217	Eylais hamata	Water Mite	AR	ARAC	140
1431	Hydracarina	Water Mite	AR	ARAC	10
198	Hydrachna marita	Water Mite	AR	ARAC	0
1330	Hydrachna sp	Water Mite	AR	ARAC	10
340	Hydrodroma despiciens	Water Mite	AR	ARAC	47
320	Hydryphantes ruber	Water Mite	AR	ARAC	10
197	Hygrobates longipalpis	Water Mite	AR	ARAC	10
194	Limnesia maculata	Water Mite	AR	ARAC	198
200	Limnesia undulata	Water Mite	AR	ARAC	196
321	Limnochares aquatica	Water Mite	AR	ARAC	82
322	Mideopsis orbicularis	Water Mite	AR	ARAC	10
1558	Orbateid mites	Orbateid Mites	AR	ARAC	99
1496	Piona carnea	Water Mite	AR	ARAC	119
319	Piona coccinea	Water Mite	AR	ARAC	140
315	Piona nodata	Water Mite	AR	ARAC	198
2087	Unionicola crassipes	Water Mite	AR	ARAC	24
1676	Allorchestes compressa	Scud	CR	AMPH	54
1044	Amphipoda	Scud Order	CR	AMPH	10
1275	Anisogammarus confervicolus	Scud	CR	AMPH	69
1586	Anisogammarus pugettensis	Scud	CR	AMPH	69
1660	Anonyx sp	Scud	CR	AMPH	128
1462	Austrochiltonia subtenuis	Scud	CR	AMPH	124
1398	Chaetogammarus marinus	Scud	CR	AMPH	207
772	Corophium acherusicum	Scud	CR	AMPH	3
1276	Corophium salmonis	Scud	CR	AMPH	0
1342	Corophium volutator	Scud	CR	AMPH	3
627	Crangonyx richmondensis lauren	Scud	CR	AMPH	31
1024	Echinogammarus stocki	Scud	CR	AMPH	0
343	Elasmopus pectinicrus	Scud	CR	AMPH	128
427	Gammarus aequicauda	Scud	CR	AMPH	196
2108	Gammarus daiberi	Scud	CR	AMPH	3
382	Gammarus duebeni	Scud	CR	AMPH	31
7	Gammarus fasciatus	Scud	CR	AMPH	31
2258	Gammarus fossarum	Scud	CR	AMPH	68
1060	Gammarus komareki	Scud	CR	AMPH	0
6	Gammarus lacustris	Scud	CR	AMPH	31
463	Gammarus limnaeus	Scud	CR	AMPH	82
712	Gammarus locusta	Scud	CR	AMPH	68
711	Gammarus oceanis	Scud	CR	AMPH	68

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1667	Gammarus olivii	Scud	CR	AMPH	0
27	Gammarus pseudolimnaeus	Scud	CR	AMPH	31
372	Gammarus pulex	Scud	CR	AMPH	68
2174	Gammarus roeselii	Scud	CR	AMPH	0
2294	Gammarus salinus	Scud	CR	AMPH	68
118	Gammarus sp	Scud	CR	AMPH	31
1347	Gammarus tigrinus	Scud	CR	AMPH	3
660	Grandidierella sp	Scud	CR	AMPH	128
724	Grandidierella lutosa	Scud	CR	AMPH	0
725	Grandidierella lignorum	Scud	CR	AMPH	0
52	Hyalella azteca	Scud	CR	AMPH	31
1713	Hyalella knickerbockeri	Scud	CR	AMPH	82
598	Hyalella sp	Scud	CR	AMPH	82
2130	Marinogammarus obtusatus	Scud	CR	AMPH	3
1600	Melita nitida	Scud	CR	AMPH	3
1458	Paracalliope fluviatilis	Scud	CR	AMPH	0
145	Parhyale hawaiensis	Scud	CR	AMPH	110
1663	Pontogeneia sp	Scud	CR	AMPH	69
516	Pontoporeia affinis	Scud	CR	AMPH	47
1453	Sideswimmers	Scud	CR	AMPH	0
120	Talitridae	Scud Family	CR	AMPH	47
366	Artemia salina	Brine Shrimp	CR	ANOS	10
421	Artemia sp	Brine Shrimp	CR	ANOS	10
1643	Heptacarpus pictus	Transparent Shrimp	CR	ANOS	69
1377	Siphonophanes grubii	Fairy Shrimp	CR	ANOS	195
519	Streptocephalus seali	Fairy Shrimp	CR	ANOS	10
1050	Argulus coregoni	Fish Louse	CR	BRAN	27
390	Argulus sp	Fish Louse	CR	BRAN	3
1780	Balanus amphitrite	Barnacle	CR	CIRR	3
643	Balanus amphitrite amphitrite	Barnacle	CR	CIRR	3
1804	Balanus balanoides	Common Barnacle	CR	CIRR	3
41	Balanus crenatus	Acorn Or Rock Barnacle	CR	CIRR	131
214	Balanus eburneus	Barnacle	CR	CIRR	3
1369	Balanus glandula	Rock Barnacle	CR	CIRR	82
771	Balanus improvisus	Barnacle	CR	CIRR	3
996	Balanus sp	Barnacle	CR	CIRR	3
642	Balanus variegatus variegatus	Barnacle	CR	CIRR	0
356	Elminius modestus	Australian Barnacle	CR	CIRR	105
2225	Lepas sp	Goose Barnacle	CR	CIRR	3
1387	Alona sp	Water Flea	CR	CLAD	10
172	Bosmina coregoni	Water Flea	CR	CLAD	10
517	Bosmina longirostris	Water Flea	CR	CLAD	10
1207	Bosmina sp	Water Flea	CR	CLAD	10
559	Bythotrephes longimanus	Water Flea	CR	CLAD	57
1631	Ceriodaphnia laticaudata	Water Flea	CR	CLAD	10
173	Ceriodaphnia pulchella	Water Flea	CR	CLAD	10
1693	Ceriodaphnia quadrangula	Water Flea	CR	CLAD	10
963	Ceriodaphnia reticulata	Water Flea	CR	CLAD	10
1386	Ceriodaphnia sp	Water Flea	CR	CLAD	10
171	Chydorus sphaericus	Water Flea	CR	CLAD	10
1385	Cladocera	Water Flea	CR	CLAD	10
1258	Daphnia ambigua	Water Flea	CR	CLAD	57
240	Daphnia carinata	Water Flea	CR	CLAD	57

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESP No
836	Daphnia cucullata	Water Flea	CR	CLAD	57
1260	Daphnia galeata	Water Flea	CR	CLAD	10
1280	Daphnia galeata mendotae	Water Flea	CR	CLAD	47
48	Daphnia hyalina	Water Flea	CR	CLAD	57
170	Daphnia longispina	Water Flea	CR	CLAD	57
5	Daphnia magna	Water Flea	CR	CLAD	10
1259	Daphnia parvula	Water Flea	CR	CLAD	47
8	Daphnia pulex	Water Flea	CR	CLAD	10
241	Daphnia pulicaria	Water Flea	CR	CLAD	53
1321	Daphnia schodleri	Water Flea	CR	CLAD	47
2055	Daphnia similis	Water Flea	CR	CLAD	47
70	Daphnia sp	Water Flea	CR	CLAD	47
2118	Graptoleberis testudinaria	Water Flea	CR	CLAD	10
1625	Leydigia sp	Water Flea	CR	CLAD	10
901	Moina macrocopa	Water Flea	CR	CLAD	10
1357	Moina micrura	Water Flea	CR	CLAD	10
1381	Moina rectrirostris	Water Flea	CR	CLAD	10
1978	Pleuroxus denticulatus	Water Flea	CR	CLAD	10
558	Polyphemus pediculus	Water Flea	CR	CLAD	10
1605	Scapholeberis mucronata	Water Flea	CR	CLAD	10
169	Sida crystallina	Water Flea	CR	CLAD	10
54	Simocephalus serrulatus	Water Flea	CR	CLAD	10
2142	Simocephalus sp	Water Flea	CR	CLAD	47
973	Simocephalus vetulus	Water Flea	CR	CLAD	10
1524	Eulimnadia sp	Clam Shrimp	CR	CONC	47
174	Lynceus brachyurus	Clam Shrimp	CR	CONC	10
520	Lynceus sp	Clam Shrimp	CR	CONC	24
152	Acanthocyclops vernalis	Cyclopoid Copepod	CR	COPE	47
560	Acanthodiaptomus denticornis	Calanoid Copepod	CR	COPE	47
1068	Acartia bifilosa	Calanoid Copepod	CR	COPE	148
1784	Acartia clausi	Calanoid Copepod	CR	COPE	3
644	Acartia simplex	Copepod	CR	COPE	0
1779	Acartia spinicauda	Calanoid Copepod	CR	COPE	188
376	Acartia tonsa	Calanoid Copepod	CR	COPE	3
1138	Calanoida	Copepod Suborder	CR	COPE	10
1776	Calanus finmarchicus	Calanoid Copepod	CR	COPE	3
439	Calanus plumchrus	Calanoid Copepod	CR	COPE	71
411	Calanus sp	Calanoid Copepod	CR	COPE	3
242	Copepoda	Copepod Order	CR	COPE	47
281	Cyclopoida	Copepod Suborder	CR	COPE	10
1912	Cyclops abyssorum	Cyclopoid Copepod	CR	COPE	206
722	Cyclops abyssorum prealpinus	Cyclopoid Copepod	CR	COPE	148
1158	Cyclops bicuspidatus	Cyclopoid Copepod	CR	COPE	47
1513	Cyclops bohater	Cyclopoid Copepod	CR	COPE	148
758	Cyclops sp	Cyclopoid Copepod	CR	COPE	47
1164	Cyclops strenuus	Cyclopoid Copepod	CR	COPE	47
1515	Cyclops vicinus kikuchii	Cyclopoid Copepod	CR	COPE	148
1514	Cyclops vicinus vicinus	Cyclopoid Copepod	CR	COPE	148
561	Cyclops vicinus	Cyclopoid Copepod	CR	COPE	206
518	Diacyclops thomasi	Calanoid Copepod	CR	COPE	47
2253	Diaptomus dorsalis	Calanoid Copepod	CR	COPE	10
1741	Diaptomus pallidus	Calanoid Copepod	CR	COPE	10
379	Diaptomus sp	Calanoid Copepod	CR	COPE	10

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1134	Epischura lacustris	Calanoid Copepod	CR	COPE	10
384	Eucyclops sp	Cyclopoid Copepod	CR	COPE	10
562	Eudiaptomus gracilis	Calanoid Copepod	CR	COPE	47
1512	Eudiaptomus graciloides	Calanoid Copepod	CR	COPE	148
721	Eudiaptomus padanus padanus	Copepod	CR	COPE	0
649	Eurytemora affinis	Calanoid Copepod	CR	COPE	47
1620	Heliodiaptomus viduus	Calanoid Copepod	CR	COPE	184
435	Lapidocera scotti	Calanoid Copepod	CR	COPE	130
1602	Limnocalanus macrurus	Calanoid Copepod	CR	COPE	10
222	Macrocyclops albidus	Cyclopoid Copepod	CR	COPE	10
1803	Megacyclops viridis	Cyclopoid Copepod	CR	COPE	47
607	Mesocyclops edax	Cyclopoid Copepod	CR	COPE	10
440	Metridia pacifica	Calanoid Copepod	CR	COPE	71
921	Microlaophonte trisetosa	Harpacticoid Copepod	CR	COPE	0
212	Nitocra spinipes	Harpacticoid Copepod	CR	COPE	10
645	Paracalanus parvus	Calanoid Copepod	CR	COPE	3
2181	Pseudocalanus elongatus	Calanoid Copepod	CR	COPE	84
740	Pseudodiaptomus coronatus	Calanoid Copepod	CR	COPE	3
646	Scutellidium sp	Harpacticoid Copepod	CR	COPE	149
1697	Spicodiaptomus chilospinus	Calanoid Copepod	CR	COPE	184
2180	Temora longicornis	Calanoid Copepod	CR	COPE	3
861	Thermocyclops crassus	Cyclopoid Copepod	CR	COPE	148
1069	Thermocyclops oithonoides	Cyclopoid Copepod	CR	COPE	148
983	Tigriopus californicus	Harpacticoid Copepod	CR	COPE	47
608	Tisbe bulbisetosa	Copepod	CR	COPE	0
1054	Tisbe clodiensis	Copepod	CR	COPE	0
1053	Tisbe holothuriae	Copepod	CR	COPE	0
703	Tortanus forcipatus	Calanoid Copepod	CR	COPE	0
573	Undinula vulgaris	Calanoid Copepod	CR	COPE	71
1323	Crustacea	Crustacean Class	CR	CRUM	47
1414	Astacidae	Crayfish Family	CR	DECA	218
1669	Astacus astacus	European Crayfish	CR	DECA	24
972	Astacus fluviatilis	Crayfish	CR	DECA	151
1582	Astacus leptodactylus	Crayfish	CR	DECA	68
696	Austrapotamobius pallipes pall	Crayfish	CR	DECA	186
887	Barytelphusa guerini	Freshwater Crab	CR	DECA	60
1440	Callianassa califoriensis	Ghost Shrimp	CR	DECA	69
76	Callinectes sapidus	Blue Crab	CR	DECA	3
1442	Cambarellus sp	Crayfish	CR	DECA	218
1023	Cambarus acuminatus	Crayfish	CR	DECA	218
896	Cambarus sp	Crayfish	CR	DECA	218
1712	Cambarus virilus	Crayfish	CR	DECA	82
1495	Cancer irroratus	Rock Crab	CR	DECA	161
339	Cancer magister	Dungeness Or Edible Crab	CR	DECA	161
2[illegible]24	Cancer pagurus	Edible Or Rock Crab	CR	DECA	131
1601	Cancer productus	Red Crab	CR	DECA	161
10	Carcinus maenas	Shore Or Green Crab	CR	DECA	161
2144	Carcinus mediterraneus	Crab	CR	DECA	207
1507	Carcinus sp	Green Crab	CR	DECA	3
1403	Caridina africana	Shrimp	CR	DECA	0
864	Caridina rajadhari	Freshwater Prawn	CR	DECA	0
1269	Caridina sp	Freshwater Prawns	CR	DECA	184
597	Clibanarius misanthropus	Hermit Crab	CR	DECA	60
1498	Clibanarius vittatus	Striped Hermit Crab	CR	DECA	3

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1834	Crab	Crab	CR	DECA	99
1907	Crangon allmanni	Shrimp	CR	DECA	207
11	Crangon crangon	Common Shrimp	CR	DECA	24
149	Crangon franciscorum	Bay Shrimp	CR	DECA	69
1662	Crangon nigricauda	Shrimp	CR	DECA	69
347	Crangon septemspinosa	Sand Shrimp	CR	DECA	3
2125	Crangon sp	Caridean Shrimp	CR	DECA	69
2263	Crangon vulgaris	Common Shrimp	CR	DECA	25
813	Crayfish	Crayfish	CR	DECA	10
1677	Cyclaspis usitata	Cumacean	CR	DECA	0
1464	Eriphia spinifrons	Crab	CR	DECA	207
220	Eualus sp	Shrimp	CR	DECA	3
1506	Eurypanopeus depressus	Mud Crab	CR	DECA	161
246	Faxonella clypeata	Crayfish	CR	DECA	218
417	Fiddler crab	Fiddler Crab	CR	DECA	99
838	Grass shrimp	Grass Shrimp	CR	DECA	99
585	Hemigrapsus nudus	Shore Crab	CR	DECA	69
1664	Hemigrapsus oregonensis	Shore Crab	CR	DECA	69
1329	Hemigrapsus sp	Shore Crab	CR	DECA	69
549	Hippolyte sp	Shrimp Or Prawn	CR	DECA	131
346	Homarus americanus	American Lobster	CR	DECA	3
582	Homarus gammarus	European Lobster	CR	DECA	24
733	Homarus vulgaris	Blue Lobster	CR	DECA	131
2085	Hyas araneus	Spider Crab	CR	DECA	3
1300	Jasus lalandei	Cape Spiney Lobster	CR	DECA	24
1004	Leptodius floridanus	Crab	CR	DECA	161
354	Lobster	Lobster	CR	DECA	99
1014	Lysmata seticaudata	Shrimp	CR	DECA	179
1905	Macrobrachium kistnensis	Shrimp	CR	DECA	184
648	Macrobrachium rosenbergii	Giant Freshwater Prawn	CR	DECA	184
1402	Macrobrachium raridus	Shrimp	CR	DECA	0
734	Maia squinado	Spinous Spider Crab	CR	DECA	151
837	Menippe mercenaria	Stone Crab	CR	DECA	161
387	Metapenaeus monoceros	Sand Shrimp	CR	DECA	60
994	Metapenaopsis barbata	Shrimp	CR	DECA	0
416	Mud crab	Mud Crab	CR	DECA	99
393	Neocaridina denticulata	Gow-Chiew Shrimp	CR	DECA	0
513	Orconectes immunis	Crayfish	CR	DECA	218
247	Orconectes limosus	Crayfish	CR	DECA	218
53	Orconectes nais	Crayfish	CR	DECA	218
602	Orconectes propinquus	Crayfish	CR	DECA	218
248	Orconectes rusticus	Crayfish	CR	DECA	218
535	Orconectes sp	Crayfish	CR	DECA	218
361	Orconectes virilis	Crayfish	CR	DECA	218
633	Oziotelphusa senex senex	Crab	CR	DECA	0
1337	Pachygrapsus crassipes	Shore Crab	CR	DECA	69
2107	Pagurus bernhardus	Hermit Crab	CR	DECA	24
490	Pagurus longicarpus	Hermit Crab	CR	DECA	3
307	Pagurus sp	Hermit Crab	CR	DECA	3
726	Palaemon adspersus	Shrimp	CR	DECA	187
732	Palaemon elegans	Shrimp	CR	DECA	187
78	Palaemon macrodactylus	Korean Shrimp	CR	DECA	69
730	Palaemon serratus	Prawn	CR	DECA	105
2080	Palaemon sp	Shrimp	CR	DECA	69

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2121	Palaemon squilla	Black Sea Shrimp	CR	DECA	207
39	Palaemonetes kadiakensis	Grass Shrimp,freshwater Prawn	CR	DECA	10
63	Palaemonetes paludosus	Grass Shrimp,freshwater Prawn	CR	DECA	10
302	Palaemonetes pugio	Grass Shrimp,freshwater Prawn	CR	DECA	10
652	Palaemonetes sp	Grass Shrimp,freshwater Prawn	CR	DECA	10
714	Palaemonetes varians	Grass Shrimp,freshwater Prawn	CR	DECA	68
72	Palaemonetes vulgaris	Grass Shrimp,freshwater Prawn	CR	DECA	10
737	Pandalus danae	Coon Stripe Shrimp	CR	DECA	69
221	Pandalus goniurus	Humpy Shrimp	CR	DECA	151
37	Pandalus montagui	Shrimp	CR	DECA	3
1005	Panopeus herbstii	Common Mud Crab	CR	DECA	161
1580	Panulirus argus	Spiny Lobster	CR	DECA	151
1982	Paragrapsus gaimardii	Estuarine Crab	CR	DECA	0
1792	Paragrapsus quadridentatus	Crab	CR	DECA	0
213	Paratelphusa jacuemontii	Crab	CR	DECA	184
2295	Paratelphusa masoniana	Crab	CR	DECA	184
1460	Paratya tasmaniensis	Shrimp	CR	DECA	0
74	Penaeus aztecus	Brown Shrimp	CR	DECA	3
718	Penaeus californiensis	Shrimp	CR	DECA	91
75	Penaeus duorarum	Pink Shrimp (america)	CR	DECA	151
1009	Penaeus indicus	Indian Prawn	CR	DECA	151
388	Penaeus japonicus	Kuruma Shrimp	CR	DECA	151
527	Penaeus kerathurus	Prawn	CR	DECA	151
1010	Penaeus merguiensis	Banana Prawn	CR	DECA	151
252	Penaeus monodon	Jumbo Tiger Prawn	CR	DECA	151
1006	Penaeus occidentalis	White Shrimp	CR	DECA	151
1007	Penaeus schmitti	White Shrimp	CR	DECA	151
1008	Penaeus semisulcatus	Shrimp	CR	DECA	60
77	Penaeus setiferus	White Shrimp (america)	CR	DECA	3
2067	Penaeus sp	Penaeidean Shrimp	CR	DECA	3
1609	Penaeus stylirostris	Shrimp	CR	DECA	91
1296	Petrolisthes armatus	Porcelain Crab	CR	DECA	91
2210	Pilumnus hirtellus	Crab	CR	DECA	105
2157	Polyonyx longicornis	Marine Crab	CR	DECA	0
621	Pontastacus leptodactylus lept	Crayfish	CR	DECA	186
2186	Porcellana longicornis	Procelain Crab	CR	DECA	105
1639	Porcellana platycheles	Porcelain Crab	CR	DECA	24
908	Portunas sp	Crab	CR	DECA	3
2148	Portunus trituberculatus	Crab	CR	DECA	129
406	Procambarus acutus acutus	White River Crayfish	CR	DECA	218
452	Procambarus alleni	Crayfish	CR	DECA	218
46	Procambarus blandingii	Crayfish	CR	DECA	218
102	Procambarus clarkii	Red Swamp Crayfish	CR	DECA	218
60	Procambarus hayi	Crayfish	CR	DECA	218
521	Procambarus simulans simulans	Crayfish	CR	DECA	218
629	Procambarus sp	Crayfish	CR	DECA	218
103	Rhithropanopeus harrisii	Mud Crab	CR	DECA	161
1261	Sesarma cinereum	Driftline Crab	CR	DECA	3

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
40	Shrimp	Shrimp	CR	DECA	99
1573	Sicyonia ingentis	Penaeid Shrimp	CR	DECA	0
1665	Uca minax	Fiddler Crab	CR	DECA	3
745	Uca pugilator	Fiddler Crab	CR	DECA	3
763	Uca pugnax	Fiddler Crab	CR	DECA	3
1627	Uca rapax	Fiddler Crab	CR	DECA	147
1628	Uca thayeri	Thalassinid Crab	CR	DECA	147
2122	Upogebia littoralis	Thalassinid Shrimp	CR	DECA	0
2066	Upogebia pugettensis	Mud Crab	CR	DECA	82
441	Euphausia pacifica	Euphausid	CR	EUPH	82
609	Asellus aquaticus	Aquatic Sowbug	CR	ISOP	10
50	Asellus brevicaudus	Aquatic Sowbug	CR	ISOP	47
243	Asellus communis	Aquatic Sowbug	CR	ISOP	10
932	Asellus hilgendorfii	Aquatic Sowbug	CR	ISOP	0
1270	Asellus intermedius	Aquatic Sowbug	CR	ISOP	33
419	Asellus militaris	Aquatic Sowbug	CR	ISOP	38
424	Asellus sp	Aquatic Sowbug	CR	ISOP	10
408	Cirolana borealis	Marine Sowbug	CR	ISOP	3
1274	Gnorimosphaeroma oregonensis	Aquatic Sowbug	CR	ISOP	120
1070	Idotea balthica	Aquatic Sowbug	CR	ISOP	3
851	Idotea balthica basteri	Aquatic Sowbug	CR	ISOP	0
402	Idotea sp	Aquatic Sowbug	CR	ISOP	3
1157	Isopoda	Sowbug Order	CR	ISOP	10
2209	Limnoria lignorum	Gribble, Aquatic Sowbug	CR	ISOP	131
2138	Lirceus fontinalis	Aquatic Sowbug	CR	ISOP	10
380	Mesidotea entomon	Aquatic Sowbug	CR	ISOP	24
1839	Sphaeroma annulatum	Aquatic Sowbug	CR	ISOP	105
1666	Sphaeroma serratum	Aquatic Sowbug	CR	ISOP	105
436	Bowmaniella dissimilis	Mysid, Opossum Shrimp	CR	MYSI	0
226	Leptomysis mediterranea	Opossum Shrimp	CR	MYSI	133
1984	Mysidacea	Mysid Or Opossum Shrimp Order	CR	MYSI	10
1295	Mysidopsis almyra	Opossum Shrimp	CR	MYSI	0
142	Mysidopsis bahia	Opossum Shrimp	CR	MYSI	0
1348	Mysis relicta	Opossum Shrimp	CR	MYSI	47
2109	Neomysis americana	Opossum Shrimp	CR	MYSI	3
735	Neomysis awatschensis	Opossum Shrimp	CR	MYSI	133
1577	Neomysis integer	Opossum Shrimp	CR	MYSI	68
1661	Neomysis sp	Opossum Shrimp	CR	MYSI	3
1542	Taphromysis louisianae	Opossum Shrimp	CR	MYSI	47
1366	Triops longicaudatus	Tadpole Shrimp	CR	NOTO	47
1012	Chlamydotheca arcuata	Ostracod	CR	OSTR	47
874	Cypretta kawatai	Ostracod	CR	OSTR	23
902	Cypria ophthalmica	Ostracod	CR	OSTR	47
1508	Cypricercus sp	Ostracod	CR	OSTR	47
728	Cypridopsis sp	Ostracod	CR	OSTR	10
24	Cypridopsis vidua	Ostracod	CR	OSTR	127
1629	Cyprinotus sp	Ostracod	CR	OSTR	47
563	Cypris pubera	Ostracod	CR	OSTR	47
1848	Cypris sp	Ostracod	CR	OSTR	10
1388	Cyprois sp	Ostracod	CR	OSTR	10
500	Heterocypris incongruens	Ostracod	CR	OSTR	127
1855	Oncocypris sp	Ostracod	CR	OSTR	0

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1135	Ostracoda	Ostracod, Seed Shrimp Subclass	CR	OSTR	47
1143	Spot shrimp	Spot Shrimp	CR	OSTR	0
160	Acilius sulcatus	Beetle	IN	COLE	0
800	Agabus seriatus	Beetle	IN	COLE	0
1370	Agabus sp	Beetle	IN	COLE	13
389	Berosus afairmaiyi	Water Scavenger Beetle	IN	COLE	0
1383	Berosus exiguus	Beetle	IN	COLE	204
1290	Berosus infuscatus	Beetle	IN	COLE	13
1537	Berosus sp	Beetle	IN	COLE	13
849	Berosus styliferus	Beetle	IN	COLE	13
1433	Bidessinae	Dytiscid Beetle Subfamily	IN	COLE	13
1536	Celina angustata	Beetle	IN	COLE	13
1127	Coleoptera	Beetles	IN	COLE	10
1559	Copelatus sp	Beetle	IN	COLE	4
1844	Cybister sp	Olive Brown Beetle	IN	COLE	13
461	Dineutus americanus	Whirligig Beetle	IN	COLE	204
1222	Dytiscidae	Diving Beetle Family	IN	COLE	10
162	Dytiscus marginalis	Beetle	IN	COLE	4
1842	Dytiscus sp	Diving Beetle	IN	COLE	10
1170	Elmidae	Riffle Beetle Family	IN	COLE	10
1384	Enochrus blatchleyi	Beetle	IN	COLE	4
1538	Enochrus sp	Beetle	IN	COLE	10
342	Eretes sticticus	Beetle	IN	COLE	213
192	Gyrinus marinus	Beetle	IN	COLE	190
2262	Gyrinus natator	Beetle	IN	COLE	76
1373	Gyrinus punctellus	Whirligig Beetle	IN	COLE	13
1430	Haliplidae	Crawling Water Beetle Family	IN	COLE	10
190	Haliplus flavicollis	Beetle	IN	COLE	146
799	Helichus striatus	Beetle	IN	COLE	10
1840	Helodidae	Beetle Family	IN	COLE	10
1368	Helophorus sp	Beetle	IN	COLE	10
191	Hydrobius fuscipes	Beetle	IN	COLE	13
1534	Hydrocanthus sp	Beetle	IN	COLE	10
1371	Hydrophilidae	Water Scavenger Beetle Family	IN	COLE	10
2000	Hydrophilus aterrimus	Water Scavenger Beetle	IN	COLE	0
1843	Hydrophilus sp	Black Beetle	IN	COLE	10
846	Hydrophilus triangularis	Beetle	IN	COLE	10
1273	Hydrovatus cuspidatus	Beetle	IN	COLE	190
1432	Hydrovatus sp	Beetle	IN	COLE	10
193	Hygrotus novemlineatus	Beetle	IN	COLE	190
845	Hygrotus sp	Beetle	IN	COLE	10
161	Illybius augustior	Beetle	IN	COLE	4
848	Laccophilus decipiens	Beetle	IN	COLE	13
1992	Laccophilus fasciatus	Beetle	IN	COLE	4
1382	Laccophilus proximus	Beetle	IN	COLE	4
1367	Laccophilus sp	Beetle	IN	COLE	10
689	Limnius sp	Riffle Beetle	IN	COLE	13
1437	Liodessus affinis	Beetle	IN	COLE	4
1528	Lissorhoptrus sp	Beetle	IN	COLE	13
1541	Listronotus appendiculatus	Weevil	IN	COLE	138

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1529	Lixellus sp	Beetle	IN	COLE	13
1272	Noteridae	Beetle Family	IN	COLE	13
1533	Onychylis nigrirostris	Beetle	IN	COLE	13
797	Optioservus fastiditus	Riffle Beetle	IN	COLE	4
917	Peltodytes sp	Beetle	IN	COLE	13
1421	Platambus maculatus	Beetle	IN	COLE	76
801	Psephenus herricki	Water Penny Beetle	IN	COLE	10
798	Stenelmis crenata	Beetle	IN	COLE	32
1540	Suphisellus sp	Beetle	IN	COLE	10
847	Thermonectus basillaris	Beetle	IN	COLE	4
1224	Tropisternus lateralis nimbatu	Beetle	IN	COLE	13
843	Tropisternus lateralis	Beetle	IN	COLE	13
1539	Tropisternus sp	Beetle	IN	COLE	13
1426	Collembola sp	Springtail Beetle	IN	COLL	13
1759	Podura aquatica	Springtail Beetle	IN	COLL	13
230	Aedes aegypti	Mosquito	IN	DIPT	212
1770	Aedes albopictus	Mosquito	IN	DIPT	72
1155	Aedes cantans	Mosquito	IN	DIPT	196
1232	Aedes communis	Mosquito	IN	DIPT	212
175	Aedes cyprius	Mosquito	IN	DIPT	196
1204	Aedes excrucians	Mosquito	IN	DIPT	212
1284	Aedes flavescens	Mosquito	IN	DIPT	212
238	Aedes nigromaculis	Mosquito	IN	DIPT	212
1229	Aedes punctor	Mosquito	IN	DIPT	72
1482	Aedes scutellaris	Mosquito	IN	DIPT	162
2090	Aedes sollicitans	Mosquito	IN	DIPT	72
1595	Aedes sp	Mosquito	IN	DIPT	212
1233	Aedes sticticus	Mosquito	IN	DIPT	212
1670	Aedes taeniorhynchus	Mosquito	IN	DIPT	212
1203	Aedes vexans	Mosquito	IN	DIPT	212
842	Anopheles freeborni	Mosquito	IN	DIPT	212
179	Anopheles maculipennis	Mosquito	IN	DIPT	76
1016	Anopheles maculipennis messae	Mosquito	IN	DIPT	196
1065	Anopheles quadrimaculatus	Mosquito	IN	DIPT	212
1545	Anopheles sp	Mosquito	IN	DIPT	212
691	Antocha sp	Crane Family	IN	DIPT	13
1690	Armigeres subalbatus	Mosquito	IN	DIPT	73
543	Atherix sp	Snipefly	IN	DIPT	13
807	Atherix variegata	Snipefly	IN	DIPT	13
1551	Brachydeutra argentata	Shore Fly	IN	DIPT	13
1123	Ceratopogonidae	Biting Midge Family	IN	DIPT	4
1623	Chaoborus astictopus	Phantom Midge	IN	DIPT	13
180	Chaoborus crystallinas	Phantom Midge	IN	DIPT	74
483	Chaoborus punctipennis	Phantom Midge	IN	DIPT	13
398	Chaoborus sp	Phantom Midge	IN	DIPT	13
256	Chironomidae	Midge Family	IN	DIPT	13
1505	Chironomus attenuatus	Midge	IN	DIPT	74
1183	Chironomus decorus	Midge	IN	DIPT	13
1251	Chironomus gripekoveni	Midge	IN	DIPT	103
278	Chironomus longilobis	Midge	IN	DIPT	0
81	Chironomus plumosus	Midge	IN	DIPT	13
964	Chironomus riparius	Midge	IN	DIPT	74
122	Chironomus sp	Midge	IN	DIPT	13
1380	Chironomus stigmaterus	Midge	IN	DIPT	74

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
85	Chironomus tentans	Midge	IN	DIPT	121
2182	Chironomus thummi	Midge	IN	DIPT	103
1182	Chironomus utahensis	Midge	IN	DIPT	13
1451	Chironomus ysohimatsui	Midge	IN	DIPT	0
626	Chrysops carbonaria	Horsefly	IN	DIPT	13
928	Crictopus trifasciatus	Midge	IN	DIPT	74
176	Cryophila lapponica	Phantom Midge	IN	DIPT	196
1056	Culex alpicalis	Mosquito	IN	DIPT	212
1673	Culex nigripalpus	Mosquito	IN	DIPT	72
2166	Culex peus	Mosquito	IN	DIPT	212
210	Culex pipiens	Mosquito	IN	DIPT	212
1230	Culex pipiens molestus	Mosquito	IN	DIPT	72
1077	Culex pipiens pipiens	Mosquito	IN	DIPT	196
1847	Culex pipiens pallens	Mosquito	IN	DIPT	163
31	Culex pipiens pallens molestus	Mosquito	IN	DIPT	0
1049	Culex pipiens quinquefasciata	Mosquito	IN	DIPT	196
397	Culex quinquefasciatus	Mosquito	IN	DIPT	212
651	Culex restuans	White Dotted Mosquito	IN	DIPT	212
1546	Culex salinarius	Mosquito	IN	DIPT	72
1042	Culex sp	Mosquito	IN	DIPT	212
647	Culex tarsalis	Mosquito	IN	DIPT	212
1579	Culex tritaeniorhynchus	Mosquito	IN	DIPT	196
1128	Culicidae	Mosquito Family	IN	DIPT	196
1231	Culiseta annulata	Mosquito	IN	DIPT	196
760	Dictya sp	Marsh Fly	IN	DIPT	10
1118	Diptera	Fly, Mosquito, Midge Order	IN	DIPT	47
1849	Dixidae	Dixa Midge Family	IN	DIPT	10
1525	Dolichopodidae	Long-Legged Fly	IN	DIPT	13
1354	Ephydridae	Shore Fly Family	IN	DIPT	10
690	Eriocera sp	Crane Fly	IN	DIPT	10
187	Eristalis sp	Flower Fly	IN	DIPT	4
1248	Eristalis tenax	Rat-Tailed Maggot/ Flower Fly	IN	DIPT	76
168	Eusimulium sp	Blackfly	IN	DIPT	4
1991	Glyptotendipes sp	Midge	IN	DIPT	4
1378	Goeldichironomus holoprassinus	Midge	IN	DIPT	121
1169	Hemerodromia sp	Dance Flies	IN	DIPT	103
1526	Lispe sp	Fly	IN	DIPT	4
177	Mochlonyx culiciformis	Phantom Midge	IN	DIPT	196
1543	Notiphila sp	Dance Fly	IN	DIPT	47
178	Orthocladius sp	Midge	IN	DIPT	4
2265	Paratanytarsus (parth form)	Midge	IN	DIPT	121
364	Paratanytarsus	Midge	IN	DIPT	4
623	Pedicia sp	Crane Fly	IN	DIPT	13
2041	Pelopiinae	Midge Subfamily	IN	DIPT	13
184	Pentaneura monilis	Midge	IN	DIPT	13
693	Pentaneura sp	Midge	IN	DIPT	13
1552	Pericoma sp	Mothfly	IN	DIPT	13
1452	Polypedilum nubifer	Midge	IN	DIPT	16
1184	Procladius sp	Midge	IN	DIPT	4
949	Prodiamesa olivacea	Midge	IN	DIPT	74
1174	Prosimulium decemarticulatum	Blackfly	IN	DIPT	74
1237	Prosimulium magnum	Blackfly	IN	DIPT	103

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1238	Prosimulium mixtum	Blackfly	IN	DIPT	163
1286	Prosimulium sp	Blackfly	IN	DIPT	4
185	Psectrocladius sp	Midge	IN	DIPT	4
1079	Psorophora columbiae	Mosquito	IN	DIPT	212
1455	Rheorthocladius	Midge	IN	DIPT	0
717	Sepedon fuscipennis	Marsh Fly	IN	DIPT	13
692	Simulidae	Blackfly Family	IN	DIPT	4
1346	Simulium arcticum	Blackfly	IN	DIPT	13
1264	Simulium equinum	Blackfly	IN	DIPT	76
873	Simulium ornatipes	Blackfly	IN	DIPT	164
228	Simulium ornatum	Blackfly	IN	DIPT	163
624	Simulium pugetense	Blackfly	IN	DIPT	13
542	Simulium sp	Blackfly	IN	DIPT	4
1235	Simulium venustum	Blackfly	IN	DIPT	13
1236	Simulium verecundum	Blackfly	IN	DIPT	74
1173	Simulium vittatum	Blackfly	IN	DIPT	13
977	Spodoptera eridania	Southern Army Worm	IN	DIPT	219
2002	Stratiomyia sp	Soldier Fly	IN	DIPT	38
1124	Stratiomyidae	Soldier Fly Family	IN	DIPT	13
1355	Tabanidae	Horsefly Family	IN	DIPT	4
2001	Tabanus sp	Horse Fly	IN	DIPT	4
1379	Tanypus grodhausi	Midge	IN	DIPT	0
104	Tanytarsus dissimilis	Midge	IN	DIPT	103
806	Tipula sp	Cranefly	IN	DIPT	4
999	Tipulidae	Cranefly Family	IN	DIPT	4
186	Triogoma	Tipulid Fly	IN	DIPT	103
1550	Xylota sp	Flower Or Hover Fly	IN	DIPT	131
1461	Atalophlebia australis	Mayfly	IN	EPHE	16
1218	Baetidae	Mayfly Family	IN	EPHE	4
1291	Baetis cingulatus	Mayfly	IN	EPHE	4
1267	Baetis intercalaris	Mayfly	IN	EPHE	4
1611	Baetis intermedius	Mayfly	IN	EPHE	93
1262	Baetis rhodani	Mayfly	IN	EPHE	76
156	Baetis sp	Mayfly	IN	EPHE	4
794	Baetisca bajkovi	Mayfly	IN	EPHE	4
611	Baetisca obesa	Mayfly	IN	EPHE	4
1163	Blasturus sp	Mayfly	IN	EPHE	10
1253	Caenis robusta	Mayfly	IN	EPHE	174
1271	Caenis sp	Mayfly	IN	EPHE	4
91	Callibaetis	Mayfly	IN	EPHE	4
1998	Centroptilum sp	Mayfly	IN	EPHE	4
157	Cloeon dipterum	Mayfly	IN	EPHE	76
399	Cloeon sp	Mayfly	IN	EPHE	4
1422	Ecdyonurus sp	Mayfly	IN	EPHE	76
377	Ephemera danica	Mayfly	IN	EPHE	76
1521	Ephemera japonica	Mayfly	IN	EPHE	40
593	Ephemera simulans	Mayfly	IN	EPHE	4
2049	Ephemera sp	Mayfly	IN	EPHE	4
613	Ephemerella cornuta	Mayfly	IN	EPHE	4
225	Ephemerella grandis	Mayfly	IN	EPHE	83
119	Ephemerella grandis grandis	Mayfly	IN	EPHE	83
796	Ephemerella invaria	Mayfly	IN	EPHE	4
674	Ephemerella sp	Mayfly	IN	EPHE	4
250	Ephemerella subvaria	Mayfly	IN	EPHE	4

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
859	Ephemerella walkerii	Mayfly	IN	EPHE	83
1216	Ephemerellidae	Mayfly Family	IN	EPHE	4
1121	Ephemeroptera	Mayfly Order	IN	EPHE	4
1997	Heptagenia diabasia	Mayfly	IN	EPHE	4
792	Heptagenia hebe	Mayfly	IN	EPHE	4
1419	Heptagenia lateralis	Mayfly	IN	EPHE	174
676	Heptageniidae	Mayfly Family	IN	EPHE	4
251	Hexagenia bilineata	Mayfly	IN	EPHE	4
592	Hexagenia limbata	Mayfly	IN	EPHE	4
61	Hexagenia rigida	Mayfly	IN	EPHE	4
530	Hexagenia sp	Mayfly	IN	EPHE	4
614	Isonychia bicolor	Mayfly	IN	EPHE	4
751	Isonychia sp	Mayfly	IN	EPHE	4
795	Leptophlebia cupida	Mayfly	IN	EPHE	4
1217	Leptophlebiidae	Mayfly Family	IN	EPHE	4
1061	Paraleptophlebia submarginata	Mayfly	IN	EPHE	174
612	Paraleptophlebia sp	Mayfly	IN	EPHE	4
1613	Paraleptophlebia pallipes	Mayfly	IN	EPHE	13
791	Potamanthus myops	Mayfly	IN	EPHE	4
1856	Povilea adusta	African Mayfly	IN	EPHE	213
1266	Pseudocloeon punctiventris	Mayfly	IN	EPHE	4
158	Siphlonurus linnaeanus	Mayfly	IN	EPHE	174
1773	Siphlonurus sp	Mayfly	IN	EPHE	4
1265	Stenacron interpunctatum	Mayfly	IN	EPHE	4
87	Stenonema candidum	Mayfly	IN	EPHE	81
603	Stenonema frontale	Mayfly	IN	EPHE	10
793	Stenonema fuscum	Mayfly	IN	EPHE	4
359	Stenonema interpunctatum	Mayfly	IN	EPHE	81
604	Stenonema luteum	Mayfly	IN	EPHE	81
539	Stenonema sp	Mayfly	IN	EPHE	4
362	Stenonema terminatum	Mayfly	IN	EPHE	4
605	Tricorythodes sp	Mayfly	IN	EPHE	4
1845	Belostoma indicum	Giant Water Bug	IN	HEMI	224
844	Belostoma sp	Giant Water Bug	IN	HEMI	4
1544	Belostoma testaceum	Giant Water Bug	IN	HEMI	137
755	Buenoa sp	Backswimmer	IN	HEMI	4
1522	Corisella decolor	Water Boatman	IN	HEMI	13
1740	Corisella sp	Water Boatman	IN	HEMI	4
858	Corixa punctata	Water Boatman	IN	HEMI	76
538	Corixidae	Water Boatman Family	IN	HEMI	4
1427	Gerridae	Water Strider Family	IN	HEMI	4
183	Gerris lacustris	Water Strider	IN	HEMI	76
460	Gerris remigis	Water Strider	IN	HEMI	4
1758	Gerris sp	Water Strider	IN	HEMI	4
1126	Hemiptera	Waterbug Order	IN	HEMI	4
2292	Hesperocorixa sp	Water Boatman	IN	HEMI	4
189	Ilyocoris cimicoides	Waterbug	IN	HEMI	49
1434	Mesovelia mulsanti	Waterbug	IN	HEMI	4
1435	Mesovelia sp	Bug	IN	HEMI	4
1841	Nepa sp	Water Scorpion	IN	HEMI	4
188	Notonecta glauca	Backswimmer	IN	HEMI	76
923	Notonecta sp	Backswimmer	IN	HEMI	4
918	Notonecta undulata	Backswimmer	IN	HEMI	4
1149	Notonecta unifasciata	Backswimmer	IN	HEMI	13

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
515	Notonectidae	Backswimmer Family	IN	HEMI	4
1247	Plea atomaria	Backswimmer	IN	HEMI	76
1873	Pleidae	Waterbug Family	IN	HEMI	4
1838	Ranatra filiformis	Water Scorpion	IN	HEMI	224
857	Sigara dorsalis	Water Bug	IN	HEMI	122
2119	Sigara sp	Water Bug	IN	HEMI	4
182	Sigara striata	Water Bug	IN	HEMI	122
1289	Trichocorixa louisianae	Water Bug	IN	HEMI	181
974	Insecta	Insect Class	IN	INSE	47
1871	Lepidoptera	Moth And Butterfly Order	IN	LEPD	4
2003	Nymphula nymphaeata	Aquatic Caterpillar	IN	LEPD	76
618	Chauliodes sp	Alderfly	IN	MEGA	4
702	Corydalus cornutus	Dobsonfly	IN	MEGA	4
544	Corydalus sp	Dobsonfly	IN	MEGA	4
805	Nigronia serricornis	Hellgrammite	IN	MEGA	4
1429	Sialidae	Alderfly Family	IN	MEGA	4
1252	Sialis lutaria	Alderfly	IN	MEGA	175
2116	Sialis sp	Alderfly	IN	MEGA	4
166	Aeshna cyanea	Dragonfly	IN	ODON	8
681	Aeshna sp	Dragonfly	IN	ODON	4
446	Agrion sp	Damselfly	IN	ODON	76
1436	Anax sp	Dragonfly	IN	ODON	4
1130	Anisoptera	Dragonfly Suborder	IN	ODON	4
804	Argia apicalis	Damselfly	IN	ODON	4
1516	Argia sp	Damselfly	IN	ODON	4
741	Basiaeschna janata	Dragonfly	IN	ODON	4
1532	Belonia sp	Dragonfly	IN	ODON	4
1168	Boyeria vinosa	Dragonfly	IN	ODON	4
164	Coenagrion pulchellum	Damselfly	IN	ODON	8
1288	Coenagrionidae	Damselfly Family	IN	ODON	4
756	Didymops sp	Dragonfly	IN	ODON	4
367	Enallagma sp	Damselfly	IN	ODON	4
1714	Epicordulia sp	Dragonfly	IN	ODON	4
1374	Gomphidae	Dragonfly Family	IN	ODON	4
803	Gomphurus vastus	Dragonfly	IN	ODON	4
1672	Ischnura heterosticta	Damselfly	IN	ODON	16
255	Ischnura sp	Damselfly	IN	ODON	4
254	Ischnura verticalis	Damselfly	IN	ODON	4
919	Lestes congener	Damselfly	IN	ODON	4
165	Lestes dryas	Damselfly	IN	ODON	4
2117	Leucorrhinia sp	Dragonfly	IN	ODON	4
2086	Libellula depressa	Dragonfly	IN	ODON	76
742	Libellula sp	Dragonfly	IN	ODON	4
1375	Libellulidae	Dragonfly Family	IN	ODON	4
459	Macromia sp	Dragonfly	IN	ODON	4
802	Neurocordulia molesta	Dragonfly	IN	ODON	4
1129	Odonata	Dragonfly And Damselfly Order	IN	ODON	4
537	Ophiogomphus sp	Dragonfly	IN	ODON	4
1549	Orthemis sp	Dragonfly	IN	ODON	13
444	Orthetrum albistylum speciosum	Dragonfly	IN	ODON	40
1531	Pachydiplax sp	Dragonfly	IN	ODON	4
1359	Pantala flavescens	Dragonfly	IN	ODON	4

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
163	Platycnemis pennipes	Dragonfly	IN	ODON	76
2293	Somatochlora cingulata	Dragonfly	IN	ODON	4
167	Sympetrum flaveolum	Dragonfly	IN	ODON	8
378	Tetragoneuria cynosura	Dragonfly	IN	ODON	4
269	Zygoptera	Damselfly Suborder	IN	ODON	4
51	Acroneuria lycorius	Stonefly	IN	PLEC	4
99	Acroneuria pacifica	Stonefly	IN	PLEC	13
1612	Acroneuria ruralis	Stonefly	IN	PLEC	13
1175	Allocapnia sp	Stonefly	IN	PLEC	13
680	Chloroperlidae	Stonefly Family	IN	PLEC	4
253	Claassenia sabulosa	Stonefly	IN	PLEC	13
1424	Dinocras cephalotes	Stonefly	IN	PLEC	76
1062	Dinocras megacephala	Stonefly	IN	PLEC	196
982	Hydroperla crosbyi	Stonefly	IN	PLEC	0
679	Isogenus sp	Stonefly	IN	PLEC	13
790	Isoperla clio	Stonefly	IN	PLEC	4
789	Isoperla signata	Stonefly	IN	PLEC	4
616	Isoperla slossonae	Stonefly	IN	PLEC	4
1172	Isoperla sp	Stonefly	IN	PLEC	4
1285	Leuctra sp	Stonefly	IN	PLEC	4
1220	Leuctridae	Stonefly	IN	PLEC	4
159	Nemoura marginata	Stonefly	IN	PLEC	28
1392	Nemoura sp	Stonefly	IN	PLEC	4
788	Nemoura trispinosa	Stonefly	IN	PLEC	4
1221	Nemouridae	Stonefly Family	IN	PLEC	4
678	Neophasganophora sp	Stonefly	IN	PLEC	13
787	Paracapnia angulata	Stonefly	IN	PLEC	4
615	Paragnetina media	Stonefly	IN	PLEC	4
536	Paragnetina sp	Stonefly	IN	PLEC	47
2010	Perla maxima	Stonefly	IN	PLEC	49
785	Perlesta placida	Stonefly	IN	PLEC	4
998	Perlidae	Stonefly Family	IN	PLEC	4
784	Phasganophora capitata	Stonefly	IN	PLEC	4
2216	Plecoptera	Stonefly	IN	PLEC	24
79	Pteronarcella badia	Stonefly	IN	PLEC	13
1113	Pteronarcidae	Stonefly Family	IN	PLEC	4
35	Pteronarcys californica	Stonefly	IN	PLEC	13
617	Pteronarcys dorsata	Stonefly	IN	PLEC	4
786	Pteronarcys pictetii	Stonefly	IN	PLEC	4
677	Pteronarcys sp	Stonefly	IN	PLEC	4
93	Taeniopteryx nivalis	Stonefly	IN	PLEC	4
1098	Anabolia nervosa	Quiver Fly	IN	TRIO	143
227	Arctopsyche grandis	Caddisfly	IN	TRIO	13
1344	Arthripsodes sp	Caddisfly	IN	TRIO	141
36	Brachycentrus americanus	Caddisfly	IN	TRIO	4
1824	Brachycentrus lateralis	Caddisfly	IN	TRIO	4
1293	Brachycentrus numerosus	Caddisfly	IN	TRIO	4
780	Brachycentrus occidentalis	Caddisfly	IN	TRIO	4
687	Brachycentrus sp	Caddisfly	IN	TRIO	4
1263	Brachycentrus subnulis	Caddisfly	IN	TRIO	143
1985	Cheumatopsyche oxa	Caddisfly	IN	TRIO	4
360	Cheumatopsyche sp	Caddisfly	IN	TRIO	4
620	Chimarra obscura	Caddisfly	IN	TRIO	4
257	Clistoronia magnifica	Caddisfly	IN	TRIO	205

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
777	Diplectrona modesta	Caddisfly	IN	TRIO	205
1822	Economus omiensis	Caddisfly	IN	TRIO	40
684	Glossosoma sp	Caddisfly	IN	TRIO	4
783	Helicopsyche borealis	Caddisfly	IN	TRIO	4
541	Helicopsyche sp	Caddisfly	IN	TRIO	4
2038	Hesperophylax sp	Caddisfly	IN	TRIO	4
1145	Holocentropus dubius	Caddisfly	IN	TRIO	143
1052	Hydropsyche angustipennis	Caddisfly	IN	TRIO	143
258	Hydropsyche betteni	Caddisfly	IN	TRIO	4
776	Hydropsyche bifida	Caddisfly	IN	TRIO	4
108	Hydropsyche californica	Caddisfly	IN	TRIO	4
1066	Hydropsyche morosa	Caddisfly	IN	TRIO	4
223	Hydropsyche pellucidulla	Caddisfly	IN	TRIO	143
1067	Hydropsyche recurvata	Caddisfly	IN	TRIO	142
540	Hydropsyche sp	Caddisfly	IN	TRIO	4
1171	Hydropsyche sparna	Caddisfly	IN	TRIO	4
1647	Hydropsychidae	Caddisfly Family	IN	TRIO	4
929	Hydroptila angusta	Caddisfly	IN	TRIO	141
2217	Hydroptilidae	Caddisfly Family	IN	TRIO	47
782	Lepidostoma griseum	Caddisfly	IN	TRIO	4
619	Lepidostoma sp	Caddisfly	IN	TRIO	4
1621	Leptocella albida	Caddisfly	IN	TRIO	205
1996	Leptocella sp	Caddisfly	IN	TRIO	13
1910	Leptoceridae	Caddisfly Family	IN	TRIO	4
153	Leptocerus aterrimus	Caddisfly	IN	TRIO	143
1646	Limnephilidae	Caddisfly Family	IN	TRIO	4
350	Limnephilus flavicornis	Caddisfly	IN	TRIO	143
92	Limnephilus sp	Caddisfly	IN	TRIO	4
155	Limnephilus stigma	Caddisfly	IN	TRIO	143
622	Macronemum sp	Caddisfly	IN	TRIO	13
781	Micrasema rusticum	Caddisfly	IN	TRIO	4
779	Neophylax concinnus	Caddisfly	IN	TRIO	4
1287	Neophylax sp	Caddisfly	IN	TRIO	4
1420	Notidobia ciliaris	Caddisfly	IN	TRIO	143
1454	Ordella maxima	Mayfly	IN	TRIO	0
1683	Orthotrichia sp	Caddisfly	IN	TRIO	4
1425	Oxyethira sp	Caddisfly	IN	TRIO	4
685	Philopotamidae	Caddisfly Family	IN	TRIO	4
1018	Phryganea sp	Caddisfly	IN	TRIO	4
154	Phryganea striata	Caddisfly	IN	TRIO	143
1645	Phryganeidae	Caddisfly Family	IN	TRIO	4
1995	Potamyia flava	Caddisfly	IN	TRIO	4
688	Psilotreta sp	Caddisfly	IN	TRIO	4
1823	Psychomyia flavida	Caddisfly	IN	TRIO	4
686	Psychomyia sp	Caddisfly	IN	TRIO	4
778	Pycnopsyche guttifer	Caddisfly	IN	TRIO	4
695	Pycnopsyche sp	Caddisfly	IN	TRIO	4
216	Rhyacophila dorsalis	Caddisfly	IN	TRIO	143
683	Rhyacophila sp	Caddisfly	IN	TRIO	4
1223	Rhyacophilidae	Caddisfly Family	IN	TRIO	4
1254	Silo pallipes	Caddisfly	IN	TRIO	143
935	Stenopsyche griseipennis	Caddisfly	IN	TRIO	40
259	Trichoptera	Caddisfly Order	IN	TRIO	4
1574	Themiste sp	Sipunculid Worm	SI	SIPU	3

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2170	Bryozoa	Bryozoan Phylum	BR	BRYO	3
448	Hyalinella punctata	Bryozoan	BR	BRYO	47
450	Lophopodella carteri	Bryozoa	BR	BRYO	10
876	Pectinatella magnifica	Bryozoa	BR	BRYO	10
449	Plumatella casmiana	Bryozoa	BR	BRYO	10
877	Plumatella emarginata	Bryozoan	BR	BRYO	47
916	American sea urchin	American Sea Urchin	EC	ECHI	99
1294	Anthocidaris crassispina	Sea Urchin	EC	ECHI	109
2202	Arbacia lixula	Sea Urchin	EC	ECHI	24
1793	Arbacia punctulata	Sea Urchin	EC	ECHI	3
489	Asterias forbesi	Common Starfish	EC	ECHI	3
56	Asterias rubens	Starfish	EC	ECHI	109
2063	Asterias vulgaris	Starfish	EC	ECHI	3
2158	Asterina gibbosa	Starlet Or Cushion Star	EC	ECHI	131
1914	Echinarachnius parma	Sand Dollar	EC	ECHI	3
2168	Echinodermata	Echinoderm Phylum	EC	ECHI	3
207	Echinometra mathaei	Sea Urchin	EC	ECHI	24
2173	Heliocidaris erythrogramma	Sea Urchin	EC	ECHI	109
2227	Leptosynapta inhaerens	Sea Cucumber	EC	ECHI	3
2088	Lytechinus pictus	Sea Urchin	EC	ECHI	69
1572	Ophiothrix spiculata	Brittle Star	EC	ECHI	69
1086	Ophiura albida	Echinoderm	EC	ECHI	199
862	Paracentrotus lividus	Sea Urchin	EC	ECHI	109
2064	Parenchinus angulosus	Sea Urchin	EC	ECHI	109
1316	Parenchinus sp	Sea Urchin	EC	ECHI	109
2081	Patiriella exigua	Starfish	EC	ECHI	80
2062	Peronella japonica	Sand Dollar	EC	ECHI	109
863	Psammechinus microtuberculatus	Sea Urchin	EC	ECHI	109
2203	Psammechinus miliaris	Sea Urchin	EC	ECHI	24
2204	Psammechinus sp	Sea Urchin	EC	ECHI	24
748	Sea urchin	Sea Urchin	EC	ECHI	99
875	Sphaerechinus granularis	Sea Urchin	EC	ECHI	109
1642	Stronglyocentrotus purpuratus	Sea Urchin	EC	ECHI	69
995	Stronglyocentrotus droebachien	Sea Urchin	EC	ECHI	69
1615	Strongylocentrotus intermedius	Sea Urchin	EC	ECHI	109
746	Strongylocentrotus nudus	Sea Urchin	EC	ECHI	109
1939	Ascidiella scabra	Sea Squirt	UR	ASCI	105
1494	Ciona intestinalis	Sea Squirt	UR	ASCI	69
2159	Dendroda grossularia	Gooseberry, Sea Squirt	UR	ASCI	178
819	Didemnum ternatanum	Sea Squirt	UR	ASCI	210
1399	Molgula manhattensis	Sea Squirt	UR	ASCI	69
822	Phallusia depressiuscula	Sea Squirt, Tunicate	UR	ASCI	178
821	Polycitor gelatinosa	Sea Squirt	UR	ASCI	177
820	Pyura praeputialis	Sea Squirt	UR	ASCI	0
1317	Pyura sp	Sea Squirt	UR	ASCI	69
1446	Styela plicata	Sea Squirt	UR	ASCI	69
2169	Urochordata	Tunicate Subphylum, Sea Squirt	UR	ASCI	3
2200	Aprionodon acutidens	Shark	CH	CARC	214
2239	Negaprion brevirostris	Lemon Shark	CH	CARC	1
2194	Dasyatis sabina	Atlantic Stingray	CH	DASY	1
2135	Ginglymostoma cirratum	Nurse Shark	CH	OREC	1
1493	Raja clavata	Thornback Ray	CH	RAJI	113

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
700	Raja erinacea	Little Skate	CH	RAJI	1
1635	Raja ocellata	Winter Skate	CH	RAJI	1
1634	Raja radiata	Thorny Skate	CH	RAJI	1
810	Scyliorhinus canicula	Dogfish	CH	SCYL	113
1026	Squalus acanthias	Spiny Dogfish	CH	SQUA	1
976	Torpedo ocellata	Electric Ray	CH	TORP	113
2291	Lampetra appendix	American Brook Lamprey	AG	PETR	1
84	Petromyzon marinus	Sea Lamprey	AG	PETR	1
888	Acipenser gueldenstaedti	Russian Sturgeon	OS	ACIP	15
1604	Acipenser gueldenstaedtii colc	Sturgeon	OS	ACIP	102
890	Acipenser nudiventris	Ship Sturgeon	OS	ACIP	15
889	Acipenser stellatus	Sevruga, Stellate Sturgeon	OS	ACIP	15
1185	Huso huso	Beluga	OS	ACIP	15
13	Agonus cataphractus	Hooknose Or Pogge	OS	AGON	15
650	Amia calva	Bowfin	OS	AMII	1
1656	Ammodytes hexapterus	Pacific Sand Lance	OS	AMMO	1
1349	Anabas scandens	Climbing Perch	OS	ANAB	191
351	Anabas testudineus	Climbing Perch	OS	ANAB	1
1633	Betta splendens	Siamese Fighting Fish	OS	ANAB	15
1632	Colisa fasciata	Giant Gourami	OS	ANAB	87
2273	Colisa lalia	Dwarf Gourami, Kungee	OS	ANAB	87
2276	Macropodus cupanus	Paradise Fish	OS	ANAB	192
1511	Macropodus opercularis	Paradise Fish	OS	ANAB	172
2243	Trichogaster pectoralis	Snake-Skinned Gourami	OS	ANAB	172
811	Trichogaster trichopterus	Blue Or 3-Spot Gourami	OS	ANAB	15
574	Anguilla anguilla	Common Eel	OS	ANGU	102
391	Anguilla japonica	Japanese Eel	OS	ANGU	182
127	Anguilla rostrata	American Eel	OS	ANGU	1
2110	Atherina hepsetus	Silverside, Sand Smelt	OS	ATHE	102
69	Labidesthes sicculus	Brook Silverside	OS	ATHE	1
1654	Leuresthes tenuis	California Grunion	OS	ATHE	1
341	Menidia beryllina	Inland Silverside	OS	ATHE	1
375	Menidia menidia	Atlantic Silverside	OS	ATHE	1
2143	Menidia peninsulae	Tidewater Silverside	OS	ATHE	1
2232	Mystus cavasius	Catfish	OS	BAGR	192
713	Mystus seenghala	Catfish	OS	BAGR	192
588	Mystus vittatus vittatus	Indian Catfish	OS	BAGR	214
308	Mystus vittatus	Catfish	OS	BAGR	15
2192	Balistidae	File Fish	OS	BALI	1
707	Opsanus beta	Gulf Toadfish	OS	BATR	1
1122	Blenniidae	Blennies	OS	BLEN	1
731	Blennius pholis	Shanny	OS	BLEN	15
701	Citharichthys stigmaeus	Speckled Sanddab	OS	BOTH	1
2193	Paralichtys lethostigma	Southern Flounder	OS	BOTH	1
1874	Paralichtys olivaceus	Hirame	OS	BOTH	15
1977	Psetta maxima	Left-Eyed Flounder, Turbot	OS	BOTH	102
1306	Seriola pappei	Line Fish, Yellowtail	OS	CARA	115
922	Seriola quinqueradiata	Yellowtail	OS	CARA	151
136	Trachinotus carolinus	Florida Pompano	OS	CARA	1
1313	Trachurus trachurus	Horse Mackerel, Scad	OS	CARA	15
1030	Carpiodes carpio	River Carpsucker	OS	CATO	1
1031	Carpiodes cyprinus	Quillback	OS	CATO	1

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1210	Catostomidae	Sucker Family	OS	CATO	20
282	Catostomus catostomus	Longnose Sucker	OS	CATO	1
283	Catostomus commersoni	White Sucker	OS	CATO	1
1195	Erimyzon sucetta	Lake Chubsucker	OS	CATO	1
2141	Hypentelium nigricans	Northern Hog Sucker	OS	CATO	1
1027	Ictiobus bubalus	Smallmouth Buffalo	OS	CATO	1
967	Ictiobus cyprinellus	Bigmouth Buffalo	OS	CATO	1
1443	Minytrema melanops	Spotted Sucker	OS	CATO	1
1029	Moxostoma erythrurum	Golden Redhorse	OS	CATO	1
1028	Moxostoma macrolepidotum	Shorthead Redhorse	OS	CATO	1
284	Moxostoma sp	Redhorse, Sucker	OS	CATO	1
289	Ambloplites rupestris	Rock Bass	OS	CENT	1
1140	Centrarchidae	Sunfish Family	OS	CENT	20
583	Enneacanthus gloriosus	Bluespotted Sunfish	OS	CENT	1
30	Lepomis cyanellus	Green Sunfish	OS	CENT	1
126	Lepomis gibbosus	Pumpkinseed	OS	CENT	1
65	Lepomis humilis	Orangespotted Sunfish	OS	CENT	1
2	Lepomis macrochirus	Bluegill	OS	CENT	1
290	Lepomis megalotis	Longear Sunfish	OS	CENT	1
96	Lepomis microlophus	Redear Sunfish	OS	CENT	1
1587	Lepomis sp	Sunfish	OS	CENT	1
106	Micropterus dolomieui	Smallmouth Bass	OS	CENT	1
2237	Micropterus punctulatus	Spotted Bass	OS	CENT	1
89	Micropterus salmoides	Largemouth Bass	OS	CENT	1
839	Micropterus sp	Bass	OS	CENT	20
100	Pomoxis annularis	White Crappie	OS	CENT	1
291	Pomoxis nigromaculatus	Black Crappie	OS	CENT	1
1619	Pomoxis sp	Crappie	OS	CENT	15
386	Chanos chanos	Milkfish, Salmon-Herring	OS	CHAN	15
673	Ophiocephalus marulius	Murrul	OS	CHAN	114
639	Ophiocephalus punctatus	Snakehead	OS	CHAN	114
1686	Alestes imbera	Characin	OS	CHAR	154
2147	Astyanax fasciatus	Banded Tetra	OS	CHAR	20
465	Gymnocorymbus ternetzi	Black Tetra, Blackamoor	OS	CHAR	15
2274	Hepsetus odoe	Pike	OS	CHAR	168
1617	Hyphessobrycon serpae	Serpa Tetra	OS	CHAR	15
579	Channa gachua	Snake-Head Catfish	OS	CHNN	192
1585	Channa marulius	Snake-Head Catfish	OS	CHNN	192
418	Channa punctatus	Snake-Head Catfish	OS	CHNN	192
528	Channa striatus	Snake-Head Catfish	OS	CHNN	192
26	Ophicephalus striatus	Snake-Head Catfish	OS	CHNN	192
1859	Chromidotilapia guntheri loen	Cichlid	OS	CICH	0
1297	Cichlasoma nigrofasciatum	Convict Cichlid	OS	CICH	1
1685	Haplochromis darlingi	Dwarf Bream	OS	CICH	168
2076	Haplochromis sp	Cichlid	OS	CICH	172
1852	Hemichromis fasciatus	Banded Jewelfish	OS	CICH	87
668	Heterotilapia multispinosa	Fish	OS	CICH	171
2050	Pseudocrenilabris philander	Moffat's Dwarf Bream	OS	CICH	197
1857	Sarotherodon galilaeus	Galilee Cichlid	OS	CICH	15
2271	Serranochromis sp	Cichlid	OS	CICH	154
2272	Serranochromis angusticeps	Cichlid	OS	CICH	154
2132	Tilapia andersonii	Bream	OS	CICH	154

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
493	Tilapia aurea	Tilapia	OS	CICH	2
1853	Tilapia kottae	Tilapia	OS	CICH	154
137	Tilapia leucosticta	Tilapia	OS	CICH	154
1687	Tilapia macrochir	Greenheaded Bream	OS	CICH	154
2242	Tilapia melanopleura	Red Breasted Bream	OS	CICH	168
1021	Tilapia melanotheron	Blackchin Tilapia	OS	CICH	1
134	Tilapia mossambica	Mozambique Tilapia	OS	CICH	1
485	Tilapia nilotica	Tilapia	OS	CICH	1
138	Tilapia rendalli	Tilapia	OS	CICH	154
128	Tilapia sp	Tilapia	OS	CICH	15
2073	Tilapia sparrmanii	Banded Bream	OS	CICH	15
113	Clarias batrachus	Walking Catfish	OS	CLAR	1
2079	Clarias gariepinus	Zambezi Barbel	OS	CLAR	15
2078	Clarias ngamensis	Labyrinth Catfish, Ndombi	OS	CLAR	168
2075	Clarias sp	Labyrinth Catfish	OS	CLAR	1
578	Alosa aestivalis	Blueback Herring	OS	CLUP	1
260	Alosa pseudoharengus	Alewife	OS	CLUP	1
144	Alosa sapidissima	American Shad	OS	CLUP	1
883	Brevoortia patronus	Gulf Menhaden	OS	CLUP	1
423	Brevoortia tyrannus	Atlantic Menhaden	OS	CLUP	1
2279	Clupea harengus	Herring	OS	CLUP	102
894	Clupea harengus pallasi	Pacific Herring	OS	CLUP	1
1519	Clupea harengus harengus	Atlantic Herring	OS	CLUP	1
261	Dorosoma cepedianum	Gizzard Shad	OS	CLUP	1
1449	Harengula jaguana	Scaled Sardine	OS	CLUP	1
1318	Sardinops ocellata	Sardine, Pilchard	OS	CLUP	15
708	Cobitis taenia	Spined Loach	OS	COBI	172
481	Lepidocephalus thermalis	Loach	OS	COBI	15
997	Misgurnus anguillicaudatus	Oriental Weatherfish	OS	COBI	1
455	Misgurnus fossilis	Loach	OS	COBI	172
662	Noemacheilus barbatulus	Stone Loach	OS	COBI	15
987	Conger conger	Conger Eel	OS	CONG	15
271	Cottus bairdi	Mottled Sculpin	OS	COTT	1
272	Cottus cognatus	Slimy Sculpin	OS	COTT	1
2045	Hemitripterus americanus	Sea Raven	OS	COTT	1
2046	Myoxocephalus octodecemspinosu	Longhorn Sculpin	OS	COTT	1
273	Myoxocephalus quadricornis	Fourhorn Sculpin	OS	COTT	1
2198	Myoxocephalus scorpius	Shorthorn Sculpin	OS	COTT	1
1653	Oligocottus maculosus	Tidepool Sculpin	OS	COTT	1
2183	Acheilognathus moriokae	Minnow, Tanago	OS	CYPI	182
195	Acrocheilus alutaceus	Chiselmouth	OS	CYPI	1
274	Agosia chrysogaster	Longfin Dace	OS	CYPI	1
759	Alburnus albidus	Fish	OS	CYPI	2
211	Alburnus alburnus	Bleak	OS	CYPI	172
1450	Barbus anoplus	Barb	OS	CYPI	5
316	Barbus barbus plebejus	Barb	OS	CYPI	195
2277	Barbus conchonius	Rosy Or Red Barb	OS	CYPI	172
852	Barbus dorsalis	Two Spot African Barb	OS	CYPI	195
1257	Barbus filamentosus	Filament Or Featherfin Barb	OS	CYPI	194
1807	Barbus guganio	Freshwater Barb	OS	CYPI	194
2259	Barbus gurneyi	Barb	OS	CYPI	5
664	Barbus holubi	Yellowfish	OS	CYPI	15

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2133	Barbus javanicus	Barb	OS	CYPI	24
1322	Barbus natalensis	Scaly	OS	CYPI	168
1584	Barbus sophore	Two Spot Barb, Dotted Barb	OS	CYPI	194
2039	Barbus sp	Barb, Yellowfish	OS	CYPI	182
94	Barbus ticto	Two Spotted,Tic Tac Toe Barb	OS	CYPI	20
369	Brachydanio rerio	Zebra Danio, Zebrafish	OS	CYPI	15
275	Campostoma anomalum	Central Stoneroller	OS	CYPI	1
25	Carassius auratus	Goldfish	OS	CYPI	1
64	Carassius carassius	Crucian Carp	OS	CYPI	2
870	Carassius sp	Carp	OS	CYPI	2
572	Catla catla	Catla	OS	CYPI	20
422	Cirrhinus mrigala	Carp, Hawk Fish	OS	CYPI	192
2196	Couesius plumbeus	Lake Chub	OS	CYPI	1
201	Ctenopharyngodon idella	Grass Carp, White Amur	OS	CYPI	15
425	Cyprinidae	Minnow Family	OS	CYPI	20
21	Cyprinus carpio	Common, Mirror, Colored, Carp	OS	CYPI	1
1520	Cyprinus carpio var communis	Carp	OS	CYPI	192
934	Dace	Dace	OS	CYPI	0
451	Danio sp	Danio	OS	CYPI	15
1711	Ericymba buccata	Silverjaw Minnow	OS	CYPI	1
1836	Esomus danrica	Flying Barb	OS	CYPI	15
1146	Fine scale carp	Fine Scale Carp	OS	CYPI	0
1990	Hybognathus placitus	Plains Minnow	OS	CYPI	1
750	Hybopsis gracilis	Flathead Chub	OS	CYPI	1
2266	Hypophthalmichthys nobilis	Carp	OS	CYPI	191
1141	Hypophthalmichthys molitrix	Silver Carp	OS	CYPI	15
860	Labeo bata	Fish	OS	CYPI	192
581	Labeo boga	Fish	OS	CYPI	192
666	Labeo capensis	Mudfish, Scalie, Yellowfish	OS	CYPI	168
1256	Labeo fimbriatus	Fish	OS	CYPI	192
202	Labeo rohita	Rohu	OS	CYPI	20
675	Labeo umbratus	Mud Fish	OS	CYPI	0
715	Leucaspius delineatus	Cyprinid	OS	CYPI	2
1015	Leuciscus cephalus	Chub	OS	CYPI	24
146	Leuciscus idus	Ide, Silver Or Golden Orfe	OS	CYPI	1
45	Leuciscus leuciscus	Dace	OS	CYPI	195
1114	Nocomis leptocephalus	Bluehead Chub	OS	CYPI	1
112	Notemigonus crysoleucas	Golden Shiner	OS	CYPI	1
1132	Notropis anogenus	Pugnose Shiner	OS	CYPI	1
143	Notropis atherinoides	Emerald Shiner	OS	CYPI	1
276	Notropis chrysocephalus	Striped Shiner	OS	CYPI	1
466	Notropis cornutus	Common Shiner	OS	CYPI	193
1133	Notropis emiliae	Pugnose Minnow	OS	CYPI	1
550	Notropis galacturus	Whitetail Shiner	OS	CYPI	1
1074	Notropis heterolepis	Blacknose Shiner	OS	CYPI	1
107	Notropis hudsonius	Spottail Shiner	OS	CYPI	1
1268	Notropis lutrensis	Red Shiner	OS	CYPI	1
1738	Notropis percobromus	Fish	OS	CYPI	0
2238	Notropis rubellus	Rosyface Shiner	OS	CYPI	1

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
467	Notropis spilopterus	Spotfin Shiner	OS	CYPI	1
1695	Notropis stramineus	Sand Shiner	OS	CYPI	1
1715	Notropis umbratilis	Redfin Shiner	OS	CYPI	1
1716	Notropis whipplei	Steelcolor Shiner	OS	CYPI	1
1739	Notropis zonatus	Bleeding Shiner	OS	CYPI	1
277	Phoxinus eos	Northern Redbelly Dace	OS	CYPI	1
383	Phoxinus phoxinus	Minnow	OS	CYPI	195
2065	Phoxinus sp	Dace	OS	CYPI	1
196	Pimephales notatus	Bluntnose Minnow	OS	CYPI	1
1	Pimephales promelas	Fathead Minnow	OS	CYPI	1
353	Pseudorasbora parva	Motsuga, Stone Moroko	OS	CYPI	24
123	Ptychocheilus oregonensis	Northern Squawfish	OS	CYPI	1
1783	Rasbora daniconius neilgherien	Tetra	OS	CYPI	0
727	Rasbora daniconia	Slender Rasbora	OS	CYPI	87
14	Rasbora heteromorpha	Harlequinfish, Red Rasbora	OS	CYPI	15
628	Rasbora neilgherriensis	Fish	OS	CYPI	0
95	Rasbora trilineata	Scissor Tail Rasbora	OS	CYPI	87
279	Rhinichthys atratulus	Blacknose Dace	OS	CYPI	1
1696	Rhinichthys cataractae	Longnose Dace	OS	CYPI	1
280	Rhinichthys osculus	Speckled Dace	OS	CYPI	1
1518	Rhodeus sericeus amarus	Bitterling	OS	CYPI	2
1212	Rutilus rutilus caspicus	Caspian Roach	OS	CYPI	2
42	Rutilus rutilus	Roach	OS	CYPI	172
2145	Scardinius erythrophthalmus	Rudd	OS	CYPI	1
18	Semotilus atromaculatus	Creek Chub	OS	CYPI	1
43	Tinca tinca	Tench	OS	CYPI	1
1675	Tribolodon hakonensis	Carp	OS	CYPI	160
808	Zacco platypus	Oikawa	OS	CYPI	182
2230	Zacco temmincki	Kawamutsu, Mutsu	OS	CYPI	182
1211	Adinia xenica	Diamond Killifish	OS	CYPO	1
2195	Aphanius dispar	Toothcarp	OS	CYPO	15
1213	Aphanius fasciatus	Tooth Carp	OS	CYPO	172
2074	Aplocheilichthys johnstonii	Tooth Carp	OS	CYPO	168
2275	Aplocheilus lineatus	Killifish	OS	CYPO	172
135	Cyprinodon macularius	Desert Pupfish	OS	CYPO	1
86	Cyprinodon variegatus	Sheepshead Minnow	OS	CYPO	1
371	Cyprinodontidae	Killifish, Topminnow Family	OS	CYPO	20
854	Fundulus confluentus	Marsh Killifish	OS	CYPO	1
124	Fundulus diaphanus	Banded Killifish	OS	CYPO	1
433	Fundulus grandis	Gulf Killifish	OS	CYPO	1
57	Fundulus heteroclitus	Mummichog	OS	CYPO	1
88	Fundulus majalis	Striped Killifish	OS	CYPO	1
1709	Fundulus notatus	Blackstripe Topminnow	OS	CYPO	1
2005	Fundulus ocellaris	Ocellated Killifish	OS	CYPO	173
409	Fundulus similis	Longnose Killifish	OS	CYPO	1
1076	Haplochilus melanostigma	Kunddian	OS	CYPO	0
101	Jordanella floridae	Flagfish	OS	CYPO	1
109	Oryzias latipes	Medaka, High-Eyes	OS	CYPO	160
2199	Rivulus cylindraceus	Green Or Brown Rivulus	OS	CYPO	87
1517	Rivulus marmoratus	Rivulus	OS	CYPO	1
1307	Argyrozona argyrozona	Silverfish	OS	DENT	115
1510	Electrophorus electricus	Electric Eel	OS	ELEC	15

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
140	Cymatogaster aggregata	Shiner Perch	OS	EMBI	1
141	Micrometrus minimus	Dwarf Perch	OS	EMBI	1
868	Engraulis encrasicolus	Anchovy	OS	ENGR	15
1073	Engraulis mordax	Northern Anchovy	OS	ENGR	1
525	Stolephorus purpureus	Nehu	OS	ENGR	15
2048	Esocidae	Pike Family	OS	ESOC	1
131	Esox lucius	Northern Pike, Pike	OS	ESOC	15
2056	Esox masquinongy chiensis	Muskellunge	OS	ESOC	0
1789	Esox masquinongy	Muskellunge	OS	ESOC	1
204	Chingata	Fish	OS	FISH	0
33	Fish	Fish	OS	FISH	99
2190	Mudfish	Mudfish	OS	FISH	0
1048	Gadus macrocephalus	Pacific Cod	OS	GADI	1
661	Gadus morhua	Atlantic Cod	OS	GADI	1
32	Gadus sp	Cod	OS	GADI	1
1034	Gaidropsarus capensis	Cod	OS	GADI	24
286	Lota lota	Burbot	OS	GADI	1
991	Pollachius virens	Coalfish Or Saithe	OS	GADI	131
641	Psetta maeotica	Black Sea Turbot	OS	GADI	102
992	Trisopterus luscus	Bib, Pouting	OS	GADI	15
288	Culaea inconstans	Brook Stickleback	OS	GASE	1
15	Gasterosteidae	Stickleback Family	OS	GASE	1
97	Gasterosteus aculeatus	Three Spine Stickleback	OS	GASE	1
2197	Pungitius pungitius	9-Spine Stickleback	OS	GASE	1
1471	Pungitius pungitius pungitius	10-Spined Stickleback	OS	GASE	102
1561	Spinachia vulgaris	15 Spine Stickleback	OS	GASE	105
2236	Eucinostomus argenteus	Spotfin Mojarra	OS	GERR	1
1228	Chaenogobius annularis	Gobi	OS	GOBI	0
445	Chasmichthus dolichognathus	Agohaze, Goby	OS	GOBI	160
1652	Gillichthys mirabilis	Longjaw Mudsucker	OS	GOBI	1
2201	Gobiidae	Goby Family	OS	GOBI	1
1189	Gobio gobio	Gudgeon	OS	GOBI	172
1659	Gobiosoma bosci	Naked Goby	OS	GOBI	1
2160	Gobiusculus flavescens	Two Spot Gobi	OS	GOBI	195
1655	Hypseleotris galli	Firetail Gudgeon	OS	GOBI	24
767	Neogobius fluviatilis	Monkey Goby	OS	GOBI	102
766	Neogobius melanostomus	Common Or Round Goby	OS	GOBI	102
2278	Pomatoschistus minutus	Sand Goby	OS	GOBI	102
1198	Orthopristis chrysoptera	Pigfish	OS	HAEM	1
352	Heteropneustes fossilis	Indian Catfish	OS	HETE	214
1428	Hiodon alosoides	Goldeye	OS	HIOD	1
1032	Hiodon tergisus	Mooneye	OS	HIOD	1
147	Ictalurus ameiurus	Catfish	OS	ICTA	0
965	Ictalurus catus	White Catfish	OS	ICTA	1
133	Ictalurus melas	Black Bullhead	OS	ICTA	1
892	Ictalurus natalis	Yellow Bullhead	OS	ICTA	1
285	Ictalurus nebulosus	Brown Bullhead	OS	ICTA	1
20	Ictalurus punctatus	Channel Catfish	OS	ICTA	45
17	Ictalurus sp	Bullhead, Catfish	OS	ICTA	1
1651	Noturus miurus	Brindled Madtom	OS	ICTA	1
969	Pylodictis olivaris	Flathead Catfish	OS	ICTA	1
524	Kuhlia sandvicensis	Aholehole	OS	KUHL	15
867	Girella punctata	Green Fish	OS	KYPH	20

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2233	Crenilabrus pavo	Wrasse	OS	LABR	116
2234	Crenilabrus tinca	Wrasse	OS	LABR	116
2270	Halichoeres poecilopterus	Kyusen	OS	LABR	160
2093	Symphodus ocellatus	Wrasse	OS	LABR	102
761	Tautogolabrus adspersus	Cunner	OS	LABR	1
80	Thalassoma bifasciatum	Bluehead Wrasse	OS	LABR	15
511	Lactarius lactarius	Butterfish, Whitefish	OS	LACT	15
2094	Leiognathus splendens	Blacktipped Ponyfish	OS	LEIO	200
1116	Lepisosteus osseus	Longnose Gar	OS	LEPS	1
968	Lepisosteus platostomus	Shortnose Gar	OS	LEPS	1
1148	Lepisosteus productus	Spotted Gar	OS	LEPS	24
1314	Lophius piscatorius	Angler Fish	OS	LOPH	15
2226	Macrognathus aculeatus	Spiny Eel	OS	MAST	15
1310	Merluccius capensis	Stock Fish	OS	MERL	15
2059	Synodontis sp	Catfish, Squeaker	OS	MOCH	168
606	Chelon engeli	White Mullet	OS	MUGI	0
150	Chelon labrosus	Thick-Lipped Grey Mullet	OS	MUGI	102
392	Liza carinata carinata	Mullet	OS	MUGI	102
71	Mugil cephalus	Striped Mullet	OS	MUGI	1
1397	Mugil curema	White Mullet	OS	MUGI	1
749	Mugil saliens	Leaping Grey Mullet	OS	MUGI	15
2146	Mugil sp	Mullet	OS	MUGI	1
1835	Nandus nandus	Nandus, Leaf Fish	OS	NAND	15
407	Notopterus notopterus	Featherback	OS	NOTP	192
1311	Genypterus copensis	Kingklip	OS	OPHI	15
2134	Oplegnathus fasciatus	Rock Bream, Japan Parrot Fish	OS	OPLE	160
1581	Mallotus villosus	Capelin	OS	OSME	1
270	Osmerus mordax	Rainbow Smelt	OS	OSME	1
292	Etheostoma caeruleum	Rainbow Darter	OS	PERC	1
891	Etheostoma exile	Iowa Darter	OS	PERC	1
1115	Etheostoma flabellare	Fantail Darter	OS	PERC	1
1691	Etheostoma nigrum	Johnny Darter	OS	PERC	1
293	Etheostoma spectabile	Orangethroat Darter	OS	PERC	1
900	Gymnocephalus cernua	Ruffe	OS	PERC	2
38	Perca flavescens	Yellow Perch	OS	PERC	1
44	Perca fluviatilis	Perch	OS	PERC	172
1614	Perca sp	Perch	OS	PERC	15
1144	Percidae	Perch Family	OS	PERC	1
62	Percina caprodes	Logperch	OS	PERC	1
469	Stizostedion canadense	Sauger	OS	PERC	1
2164	Stizostedion lucioperca	Pikeperch	OS	PERC	2
83	Stizostedion vitreum vitreum	Walleye	OS	PERC	1
125	Morone americana	White Perch	OS	PERI	1
468	Morone chrysops	White Bass	OS	PERI	1
850	Morone mississippiensis	Yellow Bass	OS	PERI	1
59	Morone saxatilis	Striped Bass	OS	PERI	1
1562	Pimelodus maculatus	Catfish	OS	PIME	165
1013	Plecoglossus altivelis	Ayu	OS	PLCO	182
1895	Limanda ferruginea	Yellowtail Flounder	OS	PLEU	1
132	Limanda limanda	Mud Dab	OS	PLEU	15
884	Paralicthys sp	Flounder	OS	PLEU	1
1178	Parophrys vetulus	English Sole	OS	PLEU	15

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2120	Platichthys flesus flesus	Flounder	OS	PLEU	102
130	Platichthys flesus	Starry, European Flounder	OS	PLEU	151
1094	Platichthys stellatus	Starry Flounder	OS	PLEU	1
129	Pleuronectes platessa	Plaice, Sand Dab	OS	PLEU	131
2241	Pseudopleuronectes yokohamae	Flounder	OS	PLEU	155
665	Pseudopleuronectes americanus	Winter Flounder	OS	PLEU	1
16	Gambusia affinis	Mosquitofish	OS	POEC	1
720	Gambusia patruelis	Mosquitofish	OS	POEC	87
1936	Gambusia sp	Mosquitofish	OS	POEC	1
1527	Heterandria formosa	Least Killifish	OS	POEC	1
73	Poecilia latipinna	Sailfin Molly	OS	POEC	1
915	Poecilia mexicana	Shortfin Molly	OS	POEC	1
28	Poecilia reticulata	Guppy	OS	POEC	1
1778	Poecilia sp	Mollies	OS	POEC	20
1136	Poecilia sphenops	Molly	OS	POEC	15
1681	Xiphophorus helleri	Green Swordtail	OS	POEC	1
287	Xiphophorus maculatus	Southern Platyfish	OS	POEC	1
1796	Chromis punctipinnis	Blacksmith	OS	POMA	1
1093	Chrysiptera hollisi	Damselfish	OS	POMA	0
262	Coregonus artedii	Cisco, Lake Herring	OS	SALM	1
263	Coregonus clupeaformis	Lake Whitefish	OS	SALM	1
925	Coregonus fera	Whitefish	OS	SALM	24
264	Coregonus hoyi	Bloater	OS	SALM	1
265	Coregonus johannae	Deepwater Cisco	OS	SALM	1
266	Coregonus kiyi	Kiyi	OS	SALM	1
2162	Coregonus lavaretus	Pollan, Whitefish	OS	SALM	102
2163	Coregonus peled	Whitefish	OS	SALM	2
267	Coregonus sp	Cisco, Whitefish	OS	SALM	1
885	Coregonus zenithicus	Shortjaw Cisco	OS	SALM	1
219	Oncorhynchus gorbuscha	Pink Salmon	OS	SALM	1
736	Oncorhynchus keta	Chum Salmon	OS	SALM	1
23	Oncorhynchus kisutch	Coho Salmon	OS	SALM	1
1051	Oncorhynchus masou	Cherry Salmon, Yamame Trout	OS	SALM	1
90	Oncorhynchus nerka	Sockeye Salmon	OS	SALM	1
22	Oncorhynchus tshawytscha	Chinook Salmon	OS	SALM	1
268	Prosopium cylindraceum	Round Whitefish	OS	SALM	1
1934	Prosopium williamsoni	Mountain Whitefish	OS	SALM	1
1445	Saghalein trout	Saghalein Trout	OS	SALM	0
589	Salmo aguabonita	Golden Trout	OS	SALM	1
34	Salmo clarki	Cutthroat Trout	OS	SALM	1
4	Salmo gairdneri	Rainbow Trout, Donaldson Trout	OS	SALM	1
68	Salmo salar	Atlantic Salmon	OS	SALM	1
49	Salmo trutta	Brown Trout	OS	SALM	1
66	Salmonidae	Trout Family	OS	SALM	1
2191	Salvelinus alpinus	Arctic Char	OS	SALM	1
3	Salvelinus fontinalis	Brook Trout	OS	SALM	1
1470	Salvelinus leucomaenis	White Spotted Char	OS	SALM	167
139	Salvelinus malma	Dolly Varden	OS	SALM	1
82	Salvelinus namaycush	Lake Trout, Siscowet	OS	SALM	45
475	Salvelinus sp	Trout, Charr	OS	SALM	15
400	Thymallus arcticus	Arctic Grayling	OS	SALM	1

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
2058	Schilbe mystus	Butter Barbel, Silver Barbel	OS	SCHI	168
295	Aplodinotus grunniens	Freshwater Drum	OS	SCIA	1
1308	Argyrosomus regius	Line Fish	OS	SCIA	102
1199	Bairdiella chrysoura	Silver Perch	OS	SCIA	1
571	Cynoscion nebulosus	Spotted Seatrout	OS	SCIA	1
110	Leiostomus xanthurus	Spot	OS	SCIA	1
882	Micropogonias undulatus	Atlantic Croaker	OS	SCIA	1
587	Otholithus ruber	Rosy Or Silver Jewfish	OS	SCIA	15
1139	Sciaenidae	Drum Family	OS	SCIA	1
1196	Sciaenops ocellatus	Red Drum	OS	SCIA	1
1319	Scomber japonicus	Chub Mackerel	OS	SCOM	1
2047	Scomber scombrus	Atlantic Mackerel	OS	SCOM	1
365	Dicentrarchus labax	Sea Bass	OS	SERR	102
1597	Epinephelus tauvina	Rockcod	OS	SERR	115
743	Serranus cabrilla	Comber	OS	SERR	102
580	Serranus scriba	Sea Bass	OS	SERR	102
1200	Galeicthys felis	Sea Catfish	OS	SILU	151
2231	Silurus glanis	Wels, European Catfish	OS	SILU	15
1036	Heteromycteris capensis	Sole	OS	SOLE	115
1020	Solea solea	Dover Sole	OS	SOLE	15
1035	Synaptura kleini	Sole	OS	SOLE	115
1312	Synaptura marginata	Tong, Sole	OS	SOLE	15
1774	Trinectes maculatus	Hogchoker	OS	SOLE	1
499	Archosargus probatocephalus	Sheepshead	OS	SPAR	1
1202	Chrysophrys major	Red Sea Bream	OS	SPAR	24
1038	Diplodus sargus	Sparid	OS	SPAR	102
19	Lagodon rhomboides	Pinfish	OS	SPAR	1
1037	Lithognathus mormyrus	Sparid	OS	SPAR	102
1039	Pachymetopon blochii	Hottentot	OS	SPAR	115
1309	Pachymetopon grande	Bronze Bream, Blue Hottentot	OS	SPAR	15
1040	Sparidae	Porgy Family	OS	SPAR	1
1447	Sparus aurata	Gilthead	OS	SPAR	102
491	Stenotomus chrysops	Scup	OS	SPAR	151
1837	Amphitnous cuchia	Cuchi	OS	SYNB	20
1658	Syngnathus fuscus	Northern Pipefish	OS	SYNG	1
1338	Tachysurus sp	Catfish	OS	TACH	214
1700	Fugo niphobles	Grass Puffer	OS	TETR	160
966	Sphoeroides maculatus	Northern Puffer	OS	TETR	1
2044	Therapon jarbua	Tigerfish, Crescent Perch	OS	THER	15
1315	Trigla capensis	Sea Robin, Gurnard	OS	TRIG	115
663	Umbra limi	Central Mudminnow	OS	UMBR	1
105	Umbra pygmaea	Eastern Mudminnow	OS	UMBR	1
971	Ambystoma maculata	Spotted Salamander	AM	AMBY	24
1701	Ambystoma mexicanum	Salamander	AM	AMBY	24
970	Ambystoma opacum	Marbled Salamander	AM	AMBY	24
2184	Ambystoma texanum	Texas Salamander	AM	AMBY	24
893	Ambystoma tigrinum	Tiger Salamander	AM	AMBY	24
2189	Amphibian	Amphibian	AM	AMPH	99
1058	Frog	Frog	AM	AMPH	99
765	Bufo americanus	American Toad	AM	BUFO	24
1194	Bufo arenarum	Toad	AM	BUFO	88

Species No.	Latin Name	Common Name	Major Code	Minor Code	RESPEC No.
1215	Bufo boreas	Western Toad	AM	BUFO	24
1553	Bufo boreas halophilus	Salt Toad	AM	BUFO	24
1091	Bufo bufo	Common Or European Toad	AM	BUFO	24
698	Bufo bufo japonicus	Frog	AM	BUFO	201
1333	Bufo marinus	Giant Toad	AM	BUFO	24
2185	Bufo quercicus	Oak Toad	AM	BUFO	85
1765	Bufo vulgaris	Toad	AM	BUFO	88
1046	Bufo vulgaris formosus	Frog	AM	BUFO	216
764	Bufo woodhousii fowleri	Fowler's Toad	AM	BUFO	85
1150	Acris sp	Cricket Frog	AM	HYLI	24
1092	Hyla chrysoscelis	Southern Grey Tree Frog	AM	HYLI	66
1468	Hyla crucifer	Spring Peeper	AM	HYLI	66
1334	Hyla ewingi	Brown Tree Frog	AM	HYLI	215
478	Hyla versicolor	Gray Tree Frog	AM	HYLI	24
1340	Pseudacris triseriata triseria	Western Chorus Frog	AM	HYLI	66
1072	Hynobius retardatus	Salamander	AM	HYNO	24
1331	Adelotus brevis	Tusked Frog	AM	LEPT	215
1332	Limnodynastes peroni	Brown Frog	AM	LEPT	215
1335	Limnodynastes tasmaniensis	Frog	AM	LEPT	215
871	Microhyla carolinensis	Narrow Mouthed Frog	AM	MICR	24
357	Microhyla ornata	Frog	AM	MICR	89
1466	Scaphiopus couchi	Couch's Spadefoot Toad	AM	PELO	24
1535	Scaphiopus hamondii	Western Spadefoot Toad	AM	PELO	24
206	Xenopus laevis	Clawed Toad	AM	PIPI	24
1492	Xenopus sp	Clawed Toad	AM	PIPI	24
523	Rana breviceps	Frog	AM	RANI	0
812	Rana catesbeiana	Bullfrog	AM	RANI	24
1071	Rana chensinensis	Frog	AM	RANI	90
1920	Rana clamitans	Green Frog	AM	RANI	24
1075	Rana cynophlyctis	Skipping Frog	AM	RANI	184
1400	Rana esculenta	Edible Frog	AM	RANI	131
1467	Rana palustris	Pickeral Frog	AM	RANI	66
358	Rana pipiens	Leopard Frog	AM	RANI	24
1033	Rana sp	Frog	AM	RANI	24
753	Rana spenocephala	Leopard Frog	AM	RANI	85
904	Rana temporaria	Frog	AM	RANI	85
368	Rana tigrina	Tiger Frog, Indian Bullfrog	AM	RANI	184
704	Notophthalamus viridescens	Salamander	AM	SALA	24
2264	Pleurodeles waltl	Iberian Ribbed Newt	AM	SALA	24
1055	Taricha granulosa	Rough Skinned Newt	AM	SALA	24
1772	Triturus alpestris	Alpine Newt	AM	SALA	24
355	Triturus cristatus	Crested Newt	AM	SALA	24
1147	Triturus cristatus carnifex	European Crested Newt	AM	SALA	24
1465	Triturus helviticus	Palmate Newt	AM	SALA	24
2252	Triturus sp	Newt	AM	SALA	24
296	Triturus viridescens	Spotted Newt	AM	SALA	217
1090	Triturus vulgaris	Smooth Newt	AM	SALA	24

ATTACHMENT E

MAJOR/MINOR SPECIES CATEGORIES

MISCELLANEOUS (MI)

AQCO	Aquatic community-plants and animals
AQIN	Invertebrates-several phyla
AQPL	Plankton-planktonic plants and animals

CYANOBACTERIA (CY)

CYAN	Cyanophyta (blue-green algae)

PROTOZOA (PR)

PROT	Protozoans, (Unicellular animals)-see also: Cyanobacteria, algae

ALGAE (AL)

By Division (See also Cyanobacteria)

ALGU	Algae; more than one division
CHLO	Chlorophyta (green algae)
CHRO	Charophyta (stoneworts)
CRYP	Cryptophyta (cryptomonads)
CRYS	Crysophyta (diatoms, coccolithids, golden algae)
EUGL	Euglenophyta (euglenoids)
PHAE	Phaeophyta (brown algae)
PYRR	Pyrrophyta (dinoflagellates)
RHOD	Rhodophyta (red algae)
XANT	Xanthophyta (yellow-green algae)

BRYOPHYTA (BY)

By Class

MUSC	Musci (mosses)

TRACHEOPHYTA (TR)

TRAC	Tracheophytes (vascular plants)

FUNGI (FU)

FUNG	Fungi

PORIFERA (PO)

PORI	Sponges

CNIDARIA (CN)

CNID	Cnidarians (hydroids, sea anemones, jellyfish)

CTENOPHORA (CT)

CTEN	Ctenophores (comb-jellies)

PLATYHELMINTHES (PL)

By Class

TURB	Turbellarians (flatworms)

GNATHOSTOMULIDA (GN)

GNAT	Gnathostomulids

NEMERTEA (NE)

NEME	Nemerteans (proboscis worms)

NEMATODA (NM)

NEMA	Nematodes (roundworms)

GASTROTRICHA (GS)

GAST	Gastrotrichs

ROTIFERA (RO)

ROTI	Rotifers

NEMATOMORPHA (NT)

NEMT	Horsehair and gordian worms

ANNELIDA (AN)

By Classes

HIRU	Hirudinea (leeches)
OLIG	Oligochaeta (earthworms)
POLY	Polychaeta (bristleworms)

BRACHIOPODA (BC)

BRAC	Brachiopods (lamp shells)

MOLLUSCA (ML)

By Classes

AMPN	Amphineura (chitons)
CEPH	Cephalopoda (squids, octopuses)
GASR	Gastropoda (snails, limpets, slugs)
PELE	Pelecypoda (bivalves, clams, mussels)

PHYLUM ARTHROPODA

ARACHNIDA (AR)

ARAC	Arachnids (mites, spiders)

CRUSTACEA (CR)

By Subclass, order or suborder

AMPH	Amphipoda (scuds)
ANOS	Anostraca (fairy shrimp)
BRAN	Branchiura (fish lice)
CIRR	Cirripedia (barnacles)
CLAD	Cladocera (water fleas)
CONC	Conchostraca (clam shrimp)
COPE	Copepoda (copepods)

CRUM	Crustaceans (several groups)
DECA	Decapoda (shrimp, crayfish, crabs)
EUPH	Euphausiacea (euphasid)
ISOP	Isopoda (sowbugs)
MYSI	Mysidacea (opossum shrimp)
NOTO	Notostraca (tadpole shrimp)
OSTR	Ostracoda (seed shrimp, ostracods)

INSECTA (IN)

By Order

COLE	Coleoptera (beetles)
COLL	Collembola (springtail beetles)
DIPT	Diptera (flies)
EPHE	Ephemeroptera (mayflies)
HEMI	Hemiptera (bugs)
INSE	Insects (several groups)
LEPD	Lepidoptera (aquatic caterpillars)
MEGA	Megaloptera (hellgrammites, alderflies, fishflies)
ODON	Odonata (dragonflies)
PLEC	Plecoptera (stoneflies)
TRIO	Trichoptera (caddisflies)

SIPUNCULA (SI)

SIPU	Sipunculid worms

BRYOZOA (BR)

BRYO	Bryozoans

ECHINODERMATA (EC)

ECHI	Echinoderms (starfish, sea urchins)

Phylum Chordata

UROCHORDATA (UR)
By class

ASCI	Ascidiacea (sea squirts, ascidians)

CHONDRICHTHYES (CH)
By family

CARC	Carcharhinidae (grey sharks)
DASY	Dasyatidae (stingrays)
OREC	Orectolobidae (carpet sharks, nurse sharks)
RAJI	Rajidae (skates, rays)
SCYL	Scyliorhinidae (cat sharks)
SQUA	Squalidae (dogfish sharks)
TORP	Torpendinidae (electric rays)

AGNATHA (AG)
By family

PETR	Petromyzontidae (lampreys)

OSTEICHTHYES (OS)
By family

ACIP	Acipenseridae (sturgeons)
AGON	Agonidae (poachers)
AMII	Amiidae (bowfins)
AMMO	Ammodytidae (sand lances)
ANAB	Anabantidae (climbing perches)
ANGU	Anguillidae (freshwater eels)
ATHE	Atherinidae (silversides)
BAGR	Bagridae (scaleless catfish)
BALI	Balistidae (leatherjackets, filefishes)
BATR	Batrachoididae (toadfishes)

BLEN	Blenniidae (blennies)
BOTH	Bothidae (lefteye flounders)
CARA	Carangidae (jacks, scads, pompanos)
CATO	Catostomidae (suckers)
CENT	Centrarchidae (sunfishes)
CHAN	Chanidae (milkfish)
CHAR	Characidae (characins)
CHNN	Channidae (snakeheads)
CICH	Cichlidae (cichlids)
CLAR	Clariidae (airbreathing catfishes)
CLUP	Clupeidae (herrings)
COBI	Cobitidae (loaches)
CONG	Congridae (conger eels)
COTT	Cottidae (sculpins)
CYPI	Cyprinidae (minnows, carps)
CYPO	Cyprinodontidae (killifishes)
DENT	Denticidae (silverfish)
ELEC	Electrophoridae (electric eels)
EMBI	Embiotocidae (surfperches)
ENGR	Engraulidae (anchovies)
ESOC	Esocidae (pikes)
FISH	Fish (several groups)
GADI	Gadidae (cods)
GASE	Gasterosteidae (sticklebacks)
GERR	Gerreidae (mojarras)
GOBI	Gobiidae (gobies)

HAEM	Haemulidae (grunts)
HETE	Heteropneustidae (air-sac catfish)
HIOD	Hiodontidae (mooneyes)
ICTA	Ictaluridae (freshwater catfishes)
KUHL	Kuhliidae (flag fish, flagtails)
KYPH	Kyphosidae (sea chubs)
LABR	Labridae (wrasses)
LACT	Lactariidae (whitefish)
LEIO	Leiognathidae (ponyfishes, slimys or slipmouths)
LEPS	Lepisosteidae (gars)
LOPH	Lophiidae (goosefishes)
MAST	Mastacembelidae (spiny eels)
MERL	Merlucciidae (cods, true hakes, whitings)
MOCH	Mochokidae (scaleless catfish)
MUGI	Mugilidae (mullets)
NAND	Nandidae (leaffish, nandids)
NOTP	Notopteridae (featherbacks)
OPHI	Ophidiidae (brotulas and cusk-eels)
OPLE	Oplegnathidae (parrot fishes)
OSME	Osmeridae (smelts)
PERC	Percidae (perches)
PERI	Percichthyidae (temperate basses)
PIME	Pimelodidae (S. American freshwater catfish)
PLCO	Plecoglossidae (Ayu)
PLEU	Pleuronectidae (righteye flounders)
POEC	Poeciliidae (livebearers)
POMA	Pomacentridae (damselfishes)

SALM	Salmonidae (trouts, salmons)
SCHI	Schilbeidae (African and Asian freshwater catfish)
SCIA	Scianenidae (drums)
SCOM	Scombridae (mackerels, tunas)
SERR	Serranidae (sea basses)
SILU	Siluridae (Eurasian freshwater catfish)
SOLE	Soleidae (soles)
SPAR	Sparidae (porgies)
SYNB	Synbranchidae (swamp eels)
SYNG	Syngnathidae (seahorses, pipefishes)
TACH	Tachysuridae (catfish)
TETR	Tetraodontidae (puffers)
THER	Theraponidae (tigerfish)
TRIG	Triglidae (gurnards and searobins)
UMBR	Umbridae (mudminnows)

AMPHIBIA (AM)
By family

AMBY	Ambystomatidae (salamanders)
AMPH	Amphibians (more than one group)
BUFO	Bufonidae (common toads)
HYLI	Hylidae (tree frogs)
HYNO	Hynobiidae (primitive salamanders)
LEPT	Leptodactylidae (frogs)
MICR	Microhylidae (narrow-mouthed toads)
PELO	Pelobatidae (spadefoot toads)
PIPI	Pipidae (clawed toads)
RANI	Ranidae (common frogs)
SALA	Salamandridae (true salamanders)

ATTACHMENT F

RESPEC: REFERENCES FOR SPECIES

REFERENCE #: 1
ROBINS,C.R., R.M.BAILEY, C.E.BOND, J.R.BROOKER,
E.A.LACHNER, R.N.LEA, AND W.B.SCOTT
1980
A LIST OF COMMON AND SCIENTIFIC NAMES OF FISHES
FROM THE UNITED STATES AND CANADA.
4TH EDITION SPEC. PUBL. NO. 12, AMERICAN FISHERIES
SOCIETY, WASHINGTON, D.C.: 149 P.; 3RD EDITION:
150 P. (1970)

REFERENCE #: 2
BLANC,M., P.BANARESCU, J.-L.GAUDET, AND J.-C.HUREAU
1971
EUROPEAN INLAND WATER FISH: A MULTILINGUAL
CATALOGUE
FISHING NEWS (BOOKS) LTD., LONDON, ENGLAND: 191 P.

REFERENCE #: 3
GOSNER,K.L.
1971
GUIDE TO IDENTIFICATION OF MARINE AND ESTUARINE
INVERTEBRATES
WILEY INTERSCIENCE, A DIV. OF JOHN WILEY AND SONS,
NEW YORK, NY:693 P.

REFERENCE #: 4
HILSENHOFF,W.L.
1975
AQUATIC INSECTS OF WISCONSIN
TECHNICAL BULLETIN NO. 89, DEPT. NATURAL RESOURCES,
MADISON, WI: 52 P.

REFERENCE #: 5
BOULENGER,G.A.
1916
CATALOGUE OF THE FRESH-WATER FISHES OF AFRICA IN
THE BRITISH MUSEUM (VOL. IV)
TRUSTEES OF THE BRITISH MUSEUM, LONDON: 392 P.

REFERENCE #: 6
CREZEE,M.
1975
MONOGRAPH OF THE SOLENOFILOMORPHIDAE (TURBELLARIA:
ACOELA)
INT. REVUE GES. HYDROBIOL. 60(6):769-845

REFERENCE #: 7
SILAS,E.G. (ED.)
1977
INDIAN FISHERIES 1947-1977
MARINE PRODUCTS EXPORT DEVELOPMENT AUTHORITY,
COCHIN, INDIA: 96 P.

REFERENCE #: 8
CORBET,P.S., C.LONGFIELD, AND N.W.MOORE
1960
DRAGONFLIES
COLLINS, ST. JAME'S PLACE, LONDON: 260 P.

REFERENCE #: 9
PATRICK,R. AND C.W.REIMER
1966
THE DIATOMS OF THE UNITED STATES. VOL. 1
MONOGRAPHS OF THE ACADEMY OF NATURAL SCIENCES OF
PHILADELPHIA NO. 13, PHILADELPHIA, PA

REFERENCE #: 10
PENNAK,R.W.
1978
FRESH-WATER INVERTEBRATES OF THE UNITED STATES
2ND EDITION, JOHN WILEY AND SONS, NEW YORK, NY:
803 P.

REFERENCE #: 11
SMITH,G.M.
1950
THE FRESHWATER ALGAE OF THE UNITED STATES
2ND EDITION, MCGRAW-HILL BOOK CO., NEW YORK, NY:
719 P.

REFERENCE #: 12
STARR,R.C.
1978
THE CULTURE COLLECTION OF ALGAE AT THE UNIVERSITY
OF TEXAS AT AUSTIN
J. PHYCOL. 14(SUPPL.): 47-100

REFERENCE #: 13
USINGER,R.L. (ED.)
1963
AQUATIC INSECTS OF CALIFORNIA
2ND PRINTING; UNIVERSITY OF CALIFORNIA PRESS,
BERKELEY, CA: 508 P.

REFERENCE #: 14
WEBER,C.I.
1971
A GUIDE TO THE COMMON DIATOMS AT WATER POLLUTION SURVEILLANCE SYSTEMS STATIONS
U.S. ENVIRONMENTAL PROTECTION AGENCY, NATIONAL ENVIRONMENTAL RESEARCH CENTER, ANALYTICAL QUALITY CONTROL LAB, CINCINNATI, OH: 101 P.

REFERENCE #: 15
WHEELER,A.
1975
FISHES OF THE WORLD. AN ILLUSTRATED DICTIONARY
MACMILLAN PUBLISHING CO., NEW YORK, NY: 366 P.

REFERENCE #: 16
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION (CSIRO) DIV. OF ENTOMOLOGY
1970
THE INSECTS OF AUSTRALIA (A TEXTBOOK FOR STUDENTS AND RESEARCH WORKERS)
MELBOURNE UNIVERSITY PRESS, MELBOURNE: 1029 P.

REFERENCE #: 17
KIRA,T.
1962
SHELLS OF THE WESTERN PACIFIC IN COLOR, VOL. 1
HOIKUSA PUBL. CO. LTD., OSAKA, JAPAN: 224 P.

REFERENCE #: 18
CORRELL,D.S. AND H.B.CORRELL
1972
AQUATIC AND WETLAND PLANTS OF THE SOUTHWESTERN UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.: 1777 P.

REFERENCE #: 19
FOGG,G.E., W.D.P.STEWART, P.FAY, AND A.E.WALSBY
1973
THE BLUE-GREEN ALGAE
ACADEMIC PRESS, NEW YORK, NY: 459 P.

REFERENCE #: 20
MIGDALALSKI,E.C. AND G.S.FICHTER
1976
THE FRESH AND SALT WATER FISHES OF THE WORLD
ALFRED A. KNOPF, NEW YORK, NY: 316 P.

REFERENCE #: 21
KAMOHARA,T.
1967
COLORED ILLUSTRATIONS OF THE FISHES OF JAPAN (REVISED)
HOIKUSA PUBL. CO. LTD., OSAKA, JAPAN: 158 P.

REFERENCE #: 22
FRETTER,V. AND A.GRAHAM
1962
BRITISH PROSOBRANCH MOLLUSCS
RAY SOCIETY, PUBL. NO. 144, ADLARD AND SON LTD.,
BARTHOLOMEW PRESS, DORKING, ENG: 755 P.

REFERENCE #: 23
SOHN,I.G. AND L.S.KORNICKER
1973
MORPHOLOGY OF CYPRETTA KAWATAI SOHN AND KORNICKER
1972 WITH A DISCUSSION OF THE GENUS
SMITHSONIAN CONTR. ZOOL. 141: 28 P.

REFERENCE #: 24
GRZIMEK,B. (ED.)
1972
GRZIMEK'S ANIMAL LIFE ENCYCLOPEDIA
VON NOSTRAND REINHOLD COMPANY, NY: 13 VOLS.
(TRANSLATION OF TIERLEBEN)

REFERENCE #: 25
NICHOLS,D., J.A.L.COOKE, AND D.WHITELEY
1971
THE OXFORD BOOK OF INVERTEBRATES
OXFORD UNIVERSITY PRESS, LONDON: 218 P.

REFERENCE #: 26
BAKER,F.C.
1911
THE LYMNAEIDAE OF NORTH AND MIDDLE AMERICA, RECENT
AND FOSSIL
CHICAGO ACADEMY OF SCIENCES, CHICAGO, IL: 539 P.

REFERENCE #: 27
FRYER,G.
1982
THE PARASITIC COPEPODA AND BRANCHIURA OF BRITISH
FRESH-WATER FISHES
FRESH-WATER BIOL. ASSOC. SCI. PUBL. NO. 46, TITUS
WILSON AND SON LTD., KENDAL, ENGLAND: 87 P.

REFERENCE #: 28
HYNES,H.B.N.
1977
A KEY TO THE ADULTS AND NYMPHS OF BRITISH
STONEFLIES, 3RD ED.
FRESH-WATER BIOL. ASSOC. SCI. PUBL. NO. 17, TITUS
WILSON, KENDAL, ENGLAND: 92 P.

REFERENCE #: 29
BURCH,J.B.
1972
BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION
MANUAL NO. 3, FRESHWATER SPHAERIACEAN CLAMS
(MOLLUSCA: PELECYPODA) OF NORTH AMERICA
WATER POLLUTION CONTROL RESEARCH SERIES, U.S.E.P.A.
WASHINGTON, D.C.: 31 P.

REFERENCE #: 30
FOSTER,N.
1976
BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION
MANUAL NO. 4, FRESHWATER POLYCHAETES (ANNELIDA)
OF NORTH AMERICA
WATER POLLUTION CONTROL RESEARCH SERIES, 18050 ELDO
3/72 2ND PRINTING, U.S.E.P.A., WASHINGTON, D.C.:
15 P.

REFERENCE #: 31
HOLSINGER,J.R.
1972
BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION
MANUAL NO. 5, THE FRESHWATER AMPHIPOD CRUSTACEANS
(GAMMARIDAE) OF NORTH AMERICA
WATER POLLUTION CONTROL RESEARCH SERIES, U.S.E.P.A.
WASHINGTON, D.C.: 89 P.

REFERENCE #: 32
BROWN,H.P.
1972
BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION
MANUAL NO. 6, AQUATIC DRYOPOID BEETLES (COLEOPTERA)
OF THE UNITED STATES
WATER POLLUTION CONTROL RESEARCH SERIES, U.S.E.P.A.
WASHINGTON, D.C.: 82 P.

REFERENCE #: 33
WILLIAMS,W.D.
1976
BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION
MANUAL NO. 7, FRESHWATER ISOPODS (ASELLIDAE) OF
NORTH AMERICA
WATER POLLUTION CONTROL RESEARCH SERIES, 18050 ELDO
5/72 2ND PRINTING, U.S.E.P.A., WASHINGTON, D.C.:
45 P.

REFERENCE #: 34
KLEMM,D.J.
1972
BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION
MANUAL NO. 8, FRESHWATER LEECHES (ANNELIDA:
HIRUDINEA) OF NORTH AMERICA
WATER POLLUTION CONTROL RESEARCH SERIES, U.S. EPA,
WASHINGTON, D.C.: 53 P.

REFERENCE #: 35
HOBBS,H.H.JR.
1976
BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION
MANUAL NO. 9, CRAYFISHES (ASTACIDAE) OF NORTH AND
MIDDLE AMERICA
WATER POLLUTION CONTROL RESEARCH SERIES, 18050 ELDO
5/72 2ND PRINTING, U.S.E.P.A., WASHINGTON, D.C.:
173 P.

REFERENCE #: 36
ASTON,H.I.
1973
AQUATIC PLANTS OF AUSTRALIA
MELBOURNE UNIVERSITY PRESS, CARLTON, VICTORIA:
368 P.

REFERENCE #: 37
LEVRING,T., H.HOPPE, AND O.SCHMID
1969
MARINE ALGAE
CRAM, DEGRUYTER AND CO., HAMBURG: 421 P.

REFERENCE #: 38
PENNAK,R.W.
1964
COLLEGIATE DICTIONARY OF ZOOLOGY
RONALD PRESS COMPANY, NEW YORK, NY: 583 P.

REFERENCE #: 39
BOLD,H.C. AND M.J.WYNNE
1978
INTRODUCTION TO THE ALGAE-STRUCTURE AND
REPRODUCTION
PRENTICE-HALL, INC., ENGLEWOOD CLIFFS, NJ: 706 P.

REFERENCE #: 40
KAWADA,T.
1961
ILLUSTRATED INSECT LARVAE OF JAPAN, 3RD ED.
THE HOKURYUKAN CO. LTD., TOKYO, JAPAN: 790 P.

REFERENCE #: 41
DAWSON,E.Y.
1956
HOW TO KNOW THE SEAWEEDS
WM. C. BROWN CO., DUBUQUE, IA: 197 P.

REFERENCE #: 42
TAYLOR,W.R.
1937
MARINE ALGAE OF THE NORTHEASTERN COAST OF NORTH AMERICA
UNIVERSITY OF MICHIGAN PRESS, ANN ARBOR, MI: 427 P.

REFERENCE #: 43
PRESCOTT,G.W.
1970
HOW TO KNOW THE FRESHWATER ALGAE
WM. C. BROWN CO., DUBUQUE, IA: 348 P.

REFERENCE #: 44
PRESCOTT,G.W.
1962
ALGAE OF THE WESTERN GREAT LAKES AREA
WM. C. BROWN CO., PUBL., DUBUQUE, IA: 977 P.

REFERENCE #: 45
SCOTT,W.B. AND E.J.CROSSMAN
1973
FRESHWATER FISHES OF CANADA
BULL. NO. 184, FISHERIES RES. BOARD OF CANADA: 966 P.

REFERENCE #: 46
JAHN,T.L. AND F.F.JAHN
1949
HOW TO KNOW THE PROTOZOA- REVISED EDITION
WM. C. BROWN CO., DUBUQUE, IA: 234 P.

REFERENCE #: 47
EDMONDSON,W.T. (ED.)
1959
FRESH-WATER BIOLOGY
2ND EDITION, JOHN WILEY AND SONS, NEW YORK, NY: 1248 P.

REFERENCE #: 48
FOGG,G.E.
1975
ALGAE CULTURES AND PHYTOPLANKTON ECOLOGY
2ND EDITION, THE UNIVERSITY OF WISCONSIN PRESS, MADISON, WI: 175 P.

REFERENCE #: 49
BEI-BIENKO,G.Y. (ED.)
1967
KEYS TO THE INSECTS OF THE EUROPEAN USSR, VOL. 1
ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATION,
JERUSALEM: 1214 P. (TRANS FROM RUSSIAN)

REFERENCE #: 50
GOODEY,T.
1951
SOIL AND FRESHWATER NEMATODES: A MONOGRAPH
JOHN WILEY AND SONS INC., NEW YORK, NY: 390 P.

REFERENCE #: 51
PETTIBONE,M.H.
1963
MARINE POLYCHAETE WORMS OF THE NEW ENGLAND REGION.
1. FAMIALIES APHRODITIDAE THROUGH TROCHOCHAETIDAE
SMITHSONIAN INST., U.S. NAT. MUSEUM, BULL. NO. 227
PART 1. U.S. GOVT. PRINTING OFFICE, WASHINGTON,
D.C.: 356 P.

REFERENCE #: 52
STERRER,W.
1972
SYSTEMATICS AND EVOLUTION WITHIN THE
GNATHOSTOMULIDA
SYST. ZOOL. 21: 151-173

REFERENCE #: 53
BRANDLOVA,J., Z.BRANDL, AND C.H.FERNANDO
1972
THE CLADOCERA OF ONTARIO WITH REMARKS ON SOME
SPECIES AND DISTRIBUTION
CAN. J. ZOOL. 50:1373-1403

REFERENCE #: 54
BARNARD,J.L.
1974
GAMMARIDEAN AMPHIPODA OF AUSTRALIA, PART II.
SMITHSONIAN CONTR. ZOOL. 139: 148 P.

REFERENCE #: 55
PONTIN,R.M.
1978
A KEY TO THE FRESHWATER PLANKTONIC AND SEMI-
PLANKTONIC ROTIFERA OF THE BRITISH ISLES
FRESHWATER BIOLOGICAL ASSOCIATION SCI. PUBL. NO.
38, TITUS WILSON AND SON LTD., KENDAL, ENGLAND:
178 P.

REFERENCE #: 56
ELLIOTT,J.M. AND K.H.MANN
1979
A KEY TO THE BRITISH FRESHWATER LEECHES WITH NOTES ON THEIR LIFE CYCLES AND ECOLOGY
FRESHWATER BIOLOGICAL ASSOCIATION SCI. PUBL. NO. 40, TITUS WILSON AND SON LTD., KENDAL, ENGLAND: 72 P.

REFERENCE #: 57
SCOURFIELD,D.J. AND J.P.HARDING
1966
A KEY TO THE BRITISH FRESHWATER CLADOCERA WITH NOTES ON THEIR ECOLOGY
3RD EDITION, FRESHWATER BIOLOGICAL ASSOCIATION SCI. PUBL. NO. 5, TITUS WILSON, KENDAL, ENGLAND: 55 P.

REFERENCE #: 58
MACAN,T.T.
1977
A KEY TO THE BRITISH FRESH- AND BRACKISH-WATER GASTROPODS WITH NOTES ON THEIR ECOLOGY
4TH EDITION, FRESHWATER BIOLOGICAL ASSOCIATION SCI. PUBL. NO. 13, TITUS WILSON AND SON LTD., KENDAL, ENGLAND: 46 P.

REFERENCE #: 59
VANLANDINGHAM,S.L.
1967
CATALOGUE OF THE FOSSIL AND RECENT GENERA AND SPECIES OF DIATOMS AND THEIR SYNONYMS.
J. CRAMER PUBL., LEHRE, GERMANY: 4 VOLS.

REFERENCE #: 60
ALCOCK,A.
1905
CATALOGUE OF THE INDIAN DECAPOD CRUSTACEA IN THE COLLECTION OF THE INDIAN MUSEUM
TRUSTEES OF THE INDIAN MUSEUM, CALCUTTA: 4 PARTS

REFERENCE #: 61
KOHLMEYER,J. AND E.KOHLMEYER
1979
MARINE MYCOLOGY: THE HIGHER FUNGI
ACADEMIC PRESS INC., N.Y.: 690 P.

REFERENCE #: 62
COX,E.R. (ED.)
1980
PHYTOFLAGELLATES
ELSEVIER NORTH HOLLAND, INC., NEW YORK, NY: 473 P.

REFERENCE #: 63
ZHADIN,V.I.
1965
MOLLUSKS OF FRESH AND BRACKISH WATERS OF THE USSR
ISRAEL PROGRAM FOR SCI. TRANSL., JERUSALEM, ISRAEL: 368 P. (TRANS. FROM RUSSIAN)

REFERENCE #: 64
GROUT,A.J.
1972
MOSS FLORA OF NORTH AMERICA NORTH OF MEXICO
HAFNER PUBL. COMPANY, NEW YORK, NY: 3 VOLS., (FACSIMILE OF 1928-1939 ED.)

REFERENCE #: 65
PHILIPOSE,M.T.
1967
CHLOROCOCCALES
INDIAN COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI: 365 P.

REFERENCE #: 66
VOGT,R.C.
1981
NATURAL HISTORY OF AMPHIBIANS AND REPTILES IN WISCONSIN
MILWAUKEE PUBLIC MUSEUM AND FRIENDS OF THE MUSEUM, INC., MILWAUKEE, WI: 205 P.

REFERENCE #: 67
FOGED,N.
1980
DIATOMS IN OLAND, SWEDEN
J. CRAMER, VADUZ, GERMANY: 193 P.

REFERENCE #: 68
GLEDHILL,T., D.W.SUTCLIFFE, AND W.D.WILLIAMS
1976
A REVISED KEY TO THE BRITISH SPECIES OF CRUSTACEA: MALACOSTRACA OCCURRING IN FRESH WATER WITH NOTES ON THEIR ECOLOGY AND DISTRIBUTION
FRESHWATER BIOLOGICAL ASSOCIATION SCI. PUBL. NO. 32, TITUS WILSON AND SON LTD., KENDAL, ENGLAND: 72 P.

REFERENCE #: 69
SMITH,R.I. AND J.T.CARLTON (EDS.)
1975
LIGHT'S MANUAL: INTERTIDAL INVERTEBRATES OF THE CENTRAL CALIFORNIA COAST
3RD EDITION, UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, CA: 716 P.

REFERENCE #: 70
NAUMOV,D.V.
1969
HYDROIDS AND HYDROMEDUSAE OF THE USSR
ISRAEL PROGRAM FOR SCI. TRANSL., JERUSALEM, ISRAEL:
660 P. (TRANS. FROM RUSSIAN)

REFERENCE #: 71
SHIH,C.T., A.J.G.FIGUEIRA, AND E.H.GRAINGER
1971
A SYNOPSIS OF CANADIAN MARINE ZOOPLANKTON
BULL. NO. 176, FISH. RES. BOARD CAN.: 264 P.

REFERENCE #: 72
CARPENTER,S.J. AND W.J.LACASSE
1974
MOSQUITOES OF NORTH AMERICA (NORTH OF MEXICO)
CALIFORNIA LIBRARY REPRINT SERIES, UNIVERSITY OF
CALIFORNIA PRESS, BERKELEY, CA: 360 P.

REFERENCE #: 73
BELKIN,J.N.
1962
THE MOSQUITOES OF THE SOUTH PACIFIC (DIPTERA,
CULICIDAE)
UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, CA:
608 P.

REFERENCE #: 74
COLE,F.R.
1969
THE FLIES OF WESTERN NORTH AMERICA
UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, CA:
693 P.

REFERENCE #: 75
ABBOTT,R.T.
1974
AMERICAN SEASHELLS. THE MARINE MOLLUSCA OF THE
ATLANTIC AND PACIFIC COASTS OF NORTH AMERICA
2ND EDITION, VAN NOSTRAND REINHOLD CO., NEW YORK,
NY: 663 P.

REFERENCE #: 76
CHINERY,M.
1974
A FIELD GUIDE TO THE INSECTS OF BRITAIN AND
NORTHERN EUROPE
HOUGHTON MIFFLIN COMPANY, BOSTON, MA: 352 P.

REFERENCE #: 77
FASSETT,N.C.
1957
A MANUAL OF AQUATIC PLANTS
THE UNIVERSITY OF WISCONSIN PRESS, MADISON, WI:
405 P.

REFERENCE #: 78
PRESCOTT,G.W.
1969
HOW TO KNOW THE AQUATIC PLANTS
WM. C. BROWN COMPANY PUBL., DUBUQUE, IA: 171 P.

REFERENCE #: 79
STOERMER,E.F. AND R.G.KREIS,JR.
1978
PRELIMINARY CHECKLIST OF DIATOMS (BACILLARIOPHYTA)
FROM THE LAURENTIAN GREAT LAKES
INTERNAT. ASSOC. GREAT LAKES RES. 4(2):149-169

REFERENCE #: 80
FISHER,W.K.
1919
STARFISH OF THE PHILIPPINE SEAS AND ADJACENT WATERS
BULLETIN NO. 100, SMITHSONIAN INST.

REFERENCE #: 81
LEWIS,P.A.
1974
TAXONOMY AND ECOLOGY OF STENONEMA MAYFLIES
(HEPTAGENIIDAE: EPHEMEROPTERA)
EPA-670/4-74-006, U.S.E.P.A., CINCINNATI, OH: 81 P.

REFERENCE #: 82
PRATT,H.S.
1935
A MANUAL OF THE COMMON INVERTEBRATE ANIMALS
(EXCLUSIVE OF INSECTS)
MCGRAW-HILL BOOK COMPANY, INC., NEW YORK, NY:
854 P.

REFERENCE #: 83
EDMUNDS,G.F.JR., S.L.JENSEN, AND L.BERNER
1976
THE MAYFLIES OF NORTH AND CENTRAL AMERICA
UNIVERSITY OF MINNESOTA PRESS, MINNEAPOLIS, MN:
330 P.

REFERENCE #: 84
HARDY,A.
1970
THE OPEN SEA: ITS NATURAL HISTORY. PART 1: THE WORLD OF PLANKTON
HOUGHTON MIFFLIN COMPANY, BOSTON, MA: 335 P.

REFERENCE #: 85
WRIGHT,A.H. AND A.A.WRIGHT
1949
HANDBOOK OF FROGS AND TOADS OF THE UNITED STATES AND CANADA
3RD EDITION, COMSTOCK PUBL. CO. INC., ITHACA, NY: 640 P.

REFERENCE #: 86
DANCE,S.P. (ED.)
1974
THE COLLECTOR'S ENCYCLOPEDIA OF SHELLS
MCGRAW-HILL BOOK COMPANY, INC., NEW YORK, NY: 288 P.

REFERENCE #: 87
AXELROD,H.R. AND L.P.SCHULTZ
1971
HANDBOOK OF TROPICAL AQUARIUM FISHES
T.F.H. PUBLICATIONS, INC., NEPTUNE CITY, NJ: 718 P.

REFERENCE #: 88
COCHRAN,D.M.
1955
FROGS OF SOUTHEASTERN BRAZIL
BULLETIN NO. 206, UNITED STATES NATIONAL MUSEUM, SMITHSONIAN INSTITIUTION, WASHINGTON, D.C.: 423 P.

REFERENCE #: 89
PARKER,H.W.
1934
A MONOGRAPH OF THE FROGS OF THE FAMILY MICROHYLIDAE
JOHNSON REPRINT CORPORATION, NEW YORK, NY: 208 P.

REFERENCE #: 90
TERENT'EV,P.V. AND S.A.CHERNOV
1965
KEY TO AMPHIBIANS AND REPTILES
3RD EDITION, ISRAEL PROGRAM FOR SCI. TRANSL., JERUSALEM, ISRAEL: 315 P. (TRANS. FROM RUSSIAN BY L.KOCHVA)

REFERENCE #: 91
BRUSCA,R.C.
1973
A HANDBOOK TO THE COMMON INTERTIDAL INVERTEBRATES OF THE GULF OF CALIFORNIA
THE UNIVERSITY OF ARIZONA PRESS, TUCSON, AZ: 427 P.

REFERENCE #: 92
PARRISH,F.K. (ED.)
1975
KEYS TO THE WATER QUALITY INDICATIVE ORGANISMS OF THE SOUTHEASTERN UNITED STATES
U.S.E.P.A., CINCINNATI, OH: 195 P.

REFERENCE #: 93
NEEDHAM,J.G., J.R.TRAVER, AND Y.-C.HSU
1969
THE BIOLOGY OF MAYFLIES WITH A SYSTEMATIC ACCOUNT OF NORTH AMERICAN SPECIES
E.W.CLASSEY LTD., HAMPTON, MIDDLESEX, ENGLAND: 759 P.

REFERENCE #: 94
HYMAN,L.H.
1940
THE INVERTEBRATES.
MCGRAW-HILL BOOK COMPANY, INC., NEW YORK, NY: VOLS.

REFERENCE #: 95
CUSHMAN,J.A.
1969
FORAMINIFERA, THEIR CLASSIFICATION AND ECONOMIC USE
HARVARD UNIVERSITY PRESS, CAMBRIDGE, MA: 605 P.

REFERENCE #: 96
BESSEY,E.A.
1965
MORPHOLOGY AND TAXONOMY OF FUNGI
HAFNER PUBLISHING COMPANY, NEW YORK, NY: 791 P.

REFERENCE #: 97
GRELL,K.G.
1973
PROTOZOOLOGY
SPRINGER-VERLAG, NEW YORK, NY: 554 P.

REFERENCE #: 98
ROGERS,J.E.
1908
THE SHELL BOOK. A POPULAR GUIDE TO A KNOWLEDGE OF THE FAMILIES OF LIVING MOLLUSKS, AND AN AID TO THE IDENTIFICATION OF SHELLS NATIVE AND FOREIGN
DOUBLEDAY, PAGE AND COMPANY, GARDEN CITY, NY:
485 P.

REFERENCE #: 99
GENERAL NAME NO VERIFICATION

REFERENCE #: 100
CARR,N.G. AND B.A.WHITTON (EDS.)
1973
THE BIOLOGY OF BLUE-GREEN ALGAE
UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, CA:
676 P.

REFERENCE #: 101
BAKER,F.C.
1928
THE FRESH WATER MOLLUSCA OF WISCONSIN. PART 1. GASTROPODA. PART II. PELECYPODA.
BULLETIN NO. 70, WISCONSIN GEOL. NATURAL HISTORY SURVEY, WISCONSIN ACAD. SCI., ARTS. LETT., PUBL.:
507 P. (PART I), 495 P. (PART II); REPRINTED 1972, VERLAG VON J. CRAMER, GERMANY

REFERENCE #: 102
HUREAU,J.C. AND T.MONOD (EDS.)
1979
CHECK-LIST OF THE FISHES OF THE NORTH-EASTERN ATLANTIC AND OF THE MEDITERRANEAN. (CLOFNAM)
UNITED NATIONS EDUCATIONAL SCI. CULTURAL ORGANIZATION, PRESSES UNIVERSITAIRES DE FRANCE, VENDOME, PARIS, FR: 2 VOLS.

REFERENCE #: 103
JOHANNSEN,O.A.
1970
AQUATIC DIPTERA
ENTOMOLOGICAL REPRINT SPECIALISTS, EAST LANSING,MI:
V PARTS; (PART V BY L.C.THOMSEN)

REFERENCE #: 104
NICHOLS,J.T. AND P.BARTSCH
1945
FISHES AND SHELLS OF THE PACIFIC WORLD
THE MACMILLAN COMPANY, NEW YORK, NY: 201 P.

REFERENCE #: 105
EALES,N.B.
1967
THE LITTORAL FAUNA OF THE BRITISH ISLES. A HANDBOOK
FOR COLLECTORS
4TH EDITION, CAMBRIDGE UNIVERSITY PRESS, LONDON,
ENGLAND: 306 P.

REFERENCE #: 106
CHAPMAN,V.J.
1962
THE ALGAE
MACMILLAN AND CO. LTD, LONDON: 472 P.

REFERENCE #: 107
SMITH,G.M. (ED.)
1951
MANUAL OF PHYCOLOGY
CHRONICA BOTANICA CO., WALTHAM, MA: 375 P.

REFERENCE #: 108
ANDREWS,J.
1971
SEA SHELLS OF THE TEXAS COAST
UNIVERSITY OF TEXAS PRESS, AUSTIN, TX: 298 P.

REFERENCE #: 109
BOOLOOTIAN,R.A. (ED.)
1966
PHYSIOLOGY OF ECHINODERMATA
JOHN WILEY AND SONS, INC., NEW YORK, NY: 822 P.

REFERENCE #: 110
BARNARD,J.L.
1979
LITTORAL GAMMARIDEAN AMPHIPODA FROM THE GULF OF
CALIFORNIA AND THE GALAPAGOS ISLANDS
SMITHSONIAN CONTR. ZOOL. 271: 149 P.

REFERENCE #: 111
COCHRAN,D.M.
1961
LIVING AMPHIBIANS OF THE WORLD
DOUBLEDAY AND COMPANY, INC., GARDEN CITY, NY:
199 P.

REFERENCE #: 112
SABELLI,B.
1979
SIMON AND SCUSTER'S GUIDE TO SHELLS
A FIRESIDE BOOK, H.S.FEINBERG (ED.), SIMON &
SCHUSTER, NEW YORK, NY: 512 P.

REFERENCE #: 113
GILBERT,P.W., R.F.MATHEWSON, AND D.P.RALL (EDS.)
1967
SHARKS, SKATES, AND RAYS
THE JOHN HOPKINS PRESS, BALTIMORE, MD: 624 P.

REFERENCE #: 114
HAMILTON,F.
1981
AN ACCOUNT OF THE FISHES FOUND IN THE RIVER GANGES
AND ITS BRANCHES
BISHEN SINGH MAHENENDIS PUL SINGH, DEHRA DUN-INDIA:
405 P. (ORIGINALLY PUBL. 1882)

REFERENCE #: 115
SMITH,J.L.B.
1961
THE SEA FISHES OF SOUTHERN AFRICA
4TH EDITION, CENTRAL NEWS AGENCY LTD., S. AFRICA:
580 P.

REFERENCE #: 116
SOLJAN,T.
1963
FISHES OF THE ADRIATIC
PUBL. FOR DEPT. OF INTERIOR AND NATL. SCI. FOUND.,
NOLIT PUBL. HOUSE, BELGRADE, YUGOSLAVIA: 428 P.
(TRANS FROM SERBO-CROATION BY M.HAYER, E.TORNQUIST
(ED.))

REFERENCE #: 117
BURNETT,A.L. (ED.)
1973
BIOLOGY OF HYDRA
ACADEMIC PRESS, NEW YORK, NY: 466 P.

REFERENCE #: 118
TAYLOR,D.L. AND H.H.SELIGER (EDS.)
1979
TOXIC DINOFLAGELLATE BLOOMS: PROC. OF THE 2ND INT.
CONF. ON TOXIC DINOFLAGELLATE BLOOMS
ELSEVIER NORTH HOLLAND INC, NEW YORK, NY: 505 P.

REFERENCE #: 119
PRASAD,V. AND D.R.COOK
1972
THE TAXONOMY OF WATER MITE LARVAE
MEMOIRS OF THE AMERICAN ENTOMOLOGICAL INSTITUTION
NO. 18, ANN ARBOR, MI: 326 P.

REFERENCE #: 120
SCHULTZ,G.A.
1969
HOW TO KNOW THE MARINE ISOPOD CRUSTACEANS
WM. C. BROWN CO. PUBL., DUBUQUE, IA: 359 P.

REFERENCE #: 121
SAETHER,O.A.
1977
FEMALE GENITALIA IN CHIRONOMIDAE AND OTHER NEMATOCERA
BULL. NO. 197, FISH. RES. BOARD CAN.: 209 P.

REFERENCE #: 122
SOUTHWOOD,T.R.E. AND D.LESTON
1959
LAND AND WATER BUGS OF THE BRITISH ISLES
FREDERICK WARNE AND CO. LTD, LONDON, ENGLAND: 436 P.

REFERENCE #: 123
BRINKHURST,R.O. AND B.G.M.JAMIESON
1971
AQUATIC OLIGOCHAETA OF THE WORLD
OLIVER AND BOYD, EDINBURGH, ENGLAND: 860 P.

REFERENCE #: 124
WILLIAMS,W.D.
1962
THE AUSTRALIAN FRESHWATER AMPHIPODS. 1. THE GENUS AUSTROCHILTONIA
AUSTR. J. MAR. FRESHW. RES. 13(2):198-216

REFERENCE #: 125
DAWSON,E.Y.
1962
NEW TAXA OF BENTHIC GREEN, BROWN AND RED ALGAE
BEAUDETTE FOUNDATION FOR BIOL. RES., SANTA YNEZ, CA: 105 P.

REFERENCE #: 126
JHINGRAN,V.G.
1982
FISH AND FISHERIES OF INDIA
2ND EDITION, HINDUSTAN PUBL. CO., DELHI, INDIA: 666 P.

REFERENCE #: 127
NEALE,J.W.
1969
THE TAXONOMY, MORPHOLOGY AND ECOLOGY OF RECENT OSTRACODA
OLIVER AND BOYD, EDINBURGH, ENGLAND: 553 P.

REFERENCE #: 128
BOUSFIELD,E.L.
1973
SHALLOW-WATER GAMMARIDEAN AMPHIPODA OF NEW ENGLAND
COMSTOCK PUBL. ASSOCIATES, CORNELL UNIVERSITY PRESS, ITHACA, NY: 312 P.

REFERENCE #: 129
BIOLOGICAL LABORATORY, IMPERIAL HOUSEHOLD (ED.)
1965
THE CRABS OF SAGAMI BAY
EAST-WEST PRESS, HONOLULU, HI: 206 P.

REFERENCE #: 130
BOWMAN,T.E.
1971
THE DISTRIBUTION OF CALANOID COPEPODS OFF THE SOUTHEASTERN UNITED STATES BETWEEN CAPE HATTERAS AND SOUTHERN FLORIDA
SMITHSONIAN CONTR. ZOOL. 96: 58 P.

REFERENCE #: 131
BURTON,M. (ED.)
1970
THE SHELL NATURAL HISTORY OF BRITAIN
RAINBIRD REF. BOOKS LTD., LONDON: 481 P.

REFERENCE #: 132
CLAYTON,R.K. AND W.R.SISTROM (EDS.)
1978
THE PHOTOSYNTHETIC BACTERIA
PLENUM PRESS, NEW YORK, NY: 946 P.

REFERENCE #: 133
TATTERSALL,W.M.
1951
A REVIEW OF THE MYSIDACEA OF THE UNITED STATES NATIONAL MUSEUM
BULL. NO. 201, SMITHSONIAN INSTITUTION, U.S. NATIONAL MUSEUM, U.S. GOVT. PRINTING OFFICE, WASHINGTON, DC: 292 P.

REFERENCE #: 134
RISER,N.W. AND M.P.MORSE (ED.)
1974
BIOLOGY OF THE TURBELLARIA
MCGRAW-HILL BOOK CO., NEW YORK, NY: 530 P.

REFERENCE #: 135
WOOD,R.D.
1967
CHAROPHYTES OF NORTH AMERICA. A GUIDE TO THE SPECIES OF CHAROPHYTES OF NORTH AMERICA, CENTRAL AMERICA AND THE WEST INDIES
STELLA'S PRINTING, UNIVERSITY OF RHODE ISLAND, KINGSTON, RI: 72 P.

REFERENCE #: 136
CLEVE,P.T.
1965
SYNOPSIS OF THE NAVICULOID DIATOMS
A.ASHER AND CO., AMSTERDAM, HOLLAND: 219 P.

REFERENCE #: 137
VAN DUZEE,E.P.
1917
CATALOGUE OF THE HEMIPTERA OF AMERICA NORTH OF MEXICO
UNIVERSITY OF CA PUBL. ENTOMOLOGY VOL. 2, UNIVERSITY OF CA PRESS, BERKELEY, CA: 902 P.

REFERENCE #: 138
O'BRIEN,C.W. AND G.J.WIBMER
1982
ANNOTATED CHECKLIST OF THE WEEVILS OF NORTH AMERICA, CENTRAL AMERICA AND THE WEST INDIES
MEMOIRS OF THE AM. ENTOMOL. INSTITUTE NO. 34, ANN ARBOR, MI: 382 P.

REFERENCE #: 139
NICHOLAS,W.L.
1975
THE BIOLOGY OF THE FREE-LIVING NEMATODES
CLARENDON PRESS, OXFORD UNIVERSITY PRESS, LONDON, ENGLAND: 219 P.

REFERENCE #: 140
COOK,D.R.
1967
WATER MITES FROM INDIA
MEMOIRS OF THE AMERICAN ENTOMOL. INSTITUTE NO. 9, ANN ARBOR, MI: 411 P.

REFERENCE #: 141
MALICKY,H.
1983
ATLAS OF EUROPEAN TRICHOPTERA
DR. W. JUNK PUBL., THE HAGUE, NETHERLANDS: 298 P.

REFERENCE #: 142
MORETTI,G.P. (ED.)
1981
PROCEEDINGS OF THE THIRD INTERNATIONAL SYMPOSIUM
ON TRICHOPTERA
DR. W. JUNK PUBL., THE HAGUE, NETHERLANDS: 472 P.

REFERENCE #: 143
HICKIN,N.E.
1967
CADDIS LARVAE. LARVAE OF THE BRITISH TRICHOPTERA
FARLEIGH DICKINSON UNIVERSITY PRESS, RUTHERFORD,
ENGLAND: 480 P.

REFERENCE #: 144
FOGED,N.
1964
FRESHWATER DIATOMS FROM SPITSBERGEN
UNIVERSITETSFORLAGET, TROMSO, OSLO: 204 P.

REFERENCE #: 145
LEE,R.E.
1980
PHYCOLOGY
CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE, ENGLAND:
478 P.

REFERENCE #: 146
BALFOUR-BROWNE,F.
1940
BRITISH WATER BEETLES
VOL. 1, RAY SOCIETY, LONDON, ENGLAND: 375 P.

REFERENCE #: 147
CRANE,J.
1975
FIDDLER CRABS OF THE WORLD (OCYPODIDAE:GENUS UCA)
PRINCETON UNIVERSITY PRESS, PRINCETON, NJ: 738 P.

REFERENCE #: 148
DUSSART,B.
1967
LES COPEPODES DES EAUX CONTINENTALES D'EUROPE
OCCIDENTALE
N. BOUBEE ET CIE, PARIS, FRANCE: TOME 1, 2

REFERENCE #: 149
LANG,K.
1948
MONOGRAPHIE DE HARPACTICIDEN
A.B.NORDISKA BOKHANDELN, STOCKHOLM, SWEDEN: 1682 P.

REFERENCE #: 150
BAYNE,B.L. (ED.)
1976
MARINE MUSSELS: THEIR ECOLOGY AND PHYSIOLOGY
CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE, GREAT
BRITAIN: 506 P.

REFERENCE #: 151
THE ORGANIZATION OF ECONOMIC CO-OPERATION AND
DEVELOPMENT OF PARIS
1968
MULTILINGUAL DICTIONARY OF FISH AND FISH PRODUCTS
WHITEFRIARS PRESS LTD, LONDON, ENGLAND: 431 P.

REFERENCE #: 152
FOGED,N.
1978
DIATOMS IN EASTERN AUSTRALIA
J. CRAMER, VADUZ, GERMANY: 242 P.

REFERENCE #: 153
MITCHELL,D.S. (ED.)
1974
AQUATIC VEGETATION AND ITS USE AND CONTROL
UNESCO, PARIS, FRANCE: 135 P.

REFERENCE #: 154
FRYER,G. AND T.D.ILES
1972
THE CICHLID FISHES OF THE GREAT LAKES OF AFRICA.
THEIR BIOLOGY AND EVOLUTION
OLIVER AND BOYD, EDINBURGH, GREAT BRITAIN: 641 P.

REFERENCE #: 155
NORMAN,J.R.
1934
A SYSTEMIC MONOGRAPH OF THE FLATFISHES
(HETEROSOMATA). VOL. 1 PSETTODIDAE, BOTHIDAE,
PLEURONECTIDAE
TRUSTEES OF THE BRITISH MUSEUM, ADLARD AND SON,
LTD., LONDON, ENGLAND: 439 P.

REFERENCE #: 156
BROWN,D.S.
1980
FRESHWATER SNAILS OF AFRICA AND THEIR MEDICAL
IMPORTANCE
TAYLOR AND FRANCIS, LTD., LONDON, ENGLAND: 487 P.

REFERENCE #: 157
LENHOFF,H.M., L.MUSCATINE, AND L.V.DAVIS
1971
EXPERIMENTAL COELENTERATE BIOLOGY
UNIVERSITY OF HAWAII PRESS, HONOLULU, HI: 281 P.

REFERENCE #: 158
CLYNE,D.
1969
AUSTRALIAN FROGS
PERIWINKLE BOOKS, LANSDOWNE PRESS, MELBOURNE,
AUSTRALIA: 112 P.

REFERENCE #: 159
FILIP'EV,I.N.
1968
FREE-LIVING MARINE NEMATODES OF THE SEVASTOPOL
AREA
PUBL. FOR SMITHSONIAN INSTITUTE AND NSF,
WASHINGTON, DC, BY ISRAEL PROGRAM FOR SCIENTIFIC
TRANSL., JERUSALEM, ISRAEL: 255 P. (TRANS. FROM
RUSSIAN BY M.RAVAH)

REFERENCE #: 160
OKADA,Y.
1966
FISHES OF JAPAN
UNO SHOTEN CO. LTD., TOKYO, JAPAN: 458 P.

REFERENCE #: 161
RATHBUN,M.J.
1930
THE CANCROID CRABS OF AMERICA OF THE FAMILIES
EURYALIDAE, PORTUNIDAE, ATELECYCLIDAE, CANCRIDAE,
AND XANTHIDAE
SMITHSONIAN INST., U.S. NAT. MUS. BULL. 152: 609 P.

REFERENCE #: 162
TRAVIS,B.V. AND R.M.LABADAN
1967
ARTHROPODS OF MEDICAL IMPORTANCE IN ASIA
TECH. RPT. 67-65-ES, SERIES ES-31, U.S. ARMY NATICK
LAB., NATICK, MA: 713 P.

REFERENCE #: 163
TRAVIS,B.V., H.H.LEE, AND R.M.LABADAN
1969
ARTHROPODS OF MEDICAL IMPORTANCE IN AMERICA NORTH OF MEXICO
TECH. RPT. 69-2-ES, SERIES ES-47, U.S. ARMY NATICK LAB., NATICK, MA: 335 P.

REFERENCE #: 164
TRAVIS,B.V., R.M.LABADAN, AND H.H.LEE
1968
ARTHROPODS OF MEDICAL IMPORTANCE IN AUSTRALIA AND THE PACIFIC ISLANDS
TECH. RPT. 68-61-ES, SERIES ES-36, U.S. ARMY NATICK LAB., NATICK, MA: 244 P.

REFERENCE #: 165
EIGENMANN,C.H. AND W.R.ALLEN
1942
FISHES OF WESTERN SOUTH AMERICA
THE UNIVERSITY OF KENTUCKY, LEXINGTON, KY: 494 P.

REFERENCE #: 166
SARMA,Y.S.R.K. AND M.KHAN
1980
ALGAL TAXONOMY IN INDIA
BOTANICAL RECORDS AND MONOGRAPHS NO. 2, NEW SERIES, TODAY AND TOMORROW'S PRINTERS AND PUBL., NEW DELHI, INDIA: 153 P.

REFERENCE #: 167
SHMIDT,P.YU.
1965
FISHES OF THE SEA OF OKHOTSK
PUBL. FOR SMITHSONIAN INSTITUTE AND N.S.F., WASHINGTON, DC, BY ISRAEL PROGRAM FOR SCIENTIFIC TRANSL., JERUSALEM, ISRAEL: 392 P. (ORIGINALLY PUBL. IN 1950)

REFERENCE #: 168
JUBB,R.A.
1967
FRESHWATER FISHES OF SOUTHERN AFRICA
A.A.BALKEMA, CAPE TOWN, S. AFRICA: 248 P.

REFFRENCE #: 169
BUROKER,N.E.
1979
POPULATION GENETICS OF THE FAMILY OSTREIDAE
MARINE BIOL., BERL. 54(2):157-169

REFERENCE #: 170
KENK,R.
1974
INDEX OF THE GENERA AND SPECIES OF THE FRESHWATER
TRICLADS (TURBELLARIA) OF THE WORLD
SMITHSONIAN CONTR. ZOOL. 183: 90 P.

REFERENCE #: 171
THORSON,T.B. (ED.)
1976
INVESTIGATIONS OF THE ICHTHYOFAUNA OF NICARAGUAN
LAKES
SCHOOL OF LIFE SCI., UNIVERSITY OF NEBRASKA-
LINCOLN, NE: 663 P.

REFERENCE #: 172
STERBA,G.
1962
FRESHWATER FISHES OF THE WORLD
VISTA BOOKS, LONGACRE PRESS LTD., LONDON, ENGLAND:
878 P. (TRANS. AND REVISED BY D.W.TUCKER)

REFERENCE #: 173
PERLMUTTER,A.
1961
GUIDE TO MARINE FISHES
NEW YORK UNIVERSITY PRESS, NY: 431 P.

REFERENCE #: 174
MACAN,T.T.
1979
A KEY TO THE NYMPHS OF THE BRITISH SPECIES OF
EPHEMEROPTERA (WITH NOTES ON THEIR ECOLOGY)
3RD EDITION, FRESHWATER BIOL. ASSOC. SCI. PUBL.
NO. 20, TITUS WILSON AND SON LTD., KENDALL,
ENGLAND: 80 P.

REFERENCE #: 175
ELLIOTT,J.M.
1977
A KEY TO THE LARVAE AND ADULTS OF THE BRITISH
FRESHWATER MEGALOPTERA AND NEUROPTERA (WITH NOTES
ON THEIR LIFE CYCLES AND ECOLOGY)
FRESHWATER BIOL. ASSOC., SCI. PUBL. NO. 35, TITUS
WILSON AND SON LTD, KENDALL, ENGLAND: 52 P.

REFERENCE #: 176
HARRING,H.K.
1913
SYNOPSIS OF THE ROTATARIA
BULL. NO. 81, SMITHSONIAN INSTITUTION, U.S. NATL. MUSEUM, U.S. GOVT. PRINTING OFFICE, WASHINGTON, DC: 225 P.

REFERENCE #: 177
KOTT,P.
1957
THE ASCIDIANS OF AUSTRALIA II.
AUSTR. J. MAR. FRESHW. RES. 8(1):64-110

REFERENCE #: 178
KOTT,P.
1969
ANTARCTIC ASCIDIACEA
ANTARCTIC RES. SER., VOL. 13, AMERICAN GEOPHYSICAL UNION WITH THE NATIONAL ACADEMY OF SCI., WASHINGTON, DC: 239 P.

REFERENCE #: 179
BRANDT,K.A.H. (ED.)
1964
NORDISCHES PLANKTON
A. ASHER AND CO., AMSTERDAM, HOLLAND: 8 VOLS. (ORIGINALLY PUBL. 1901-1942)

REFERENCE #: 180
FOREST,H.S.
1954
HANDBOOK OF ALGAE
THE UNIVERSITY OF TENNESSEE PRESS, KNOXVILLE,TN: 467 P.

REFERENCE #: 181
HUNGERFORD,H.B.
1948
THE CORIXIDIAE OF THE WESTERN HEMISPHERE
THE UNIVERSITY OF KANSAS SCI. BULL., VOL. 32, ENTOMOLOGICAL REPRINT SPECIALISTS, LOS ANGELES, CA: 827 P. (1977)

REFERENCE #: 182
OKADA,Y.
1960
STUDIES ON THE FRESHWATER FISHES OF JAPAN
PREFECTURAL UNIVERSITY OF MIE TSE, MIE PREFECTURE, JAPAN: 860 P.

REFERENCE #: 183
WRIGHT,C.A.
1962
PLANORBINA, TAPHIUS, AND AMIGERUS: PROPOSED SUPPRESSION UNDER THE PLENARY POWERS
BULL. ZOOL. NOMENCLATURE 19:39-41

REFERENCE #: 184
TONAPI,G.T.
1980
FRESHWATER ANIMALS OF INDIA. (AN ECOLOGICAL APPROACH)
OXFORD AND IBH PUBLICATIONS, NEW DELHI, INDIA: 341 P.

REFERENCE #: 185
KUDO,R.R.
1966
PROTOZOOLOGY
5TH EDITION, CHARLES C. THOMAS PUBL., SPRINGFIELD, IL: 1174 P.

REFERENCE #: 186
LAURENT,P.J.
1979
FRESHWATER CRAYFISH IV. PAPERS FROM THE 4TH INTERNATIONAL SYMPOSIUM ON FRESHWATER CRAYFISH.
INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE THONON-LES-BAINS, FRANCE: 473 P.

REFERENCE #: 187
SMALDON,G.
1979
BRITISH COASTAL SHRIMPS AND PRAWNS
ACADEMIC PRESS, LONDON, ENGLAND: 126 P.

REFERENCE #: 188
KASTURIRANGON,L.P.
1963
A KEY FOR THE IDENTIFICATION OF THE MORE COMMON PLANKTONIC COPEPODA OF THE INDIAN COASTAL WATERS
COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, NEW DELHI, INDIA: 87 P.

REFERENCE #: 189
CLARKE,A.H.
1981
THE FRESHWATER MOLLUSCS OF CANADA
NATIONAL MUSEUMS OF NATURAL SCIENCES, NATIONAL MUSEUMS OF CANADA, OTTAWA, CANADA: 446 P.

REFERENCE #: 190
ZAUTSEU,F.A.
1972
FAUNA OF THE USSR, COLEOPTERA, VOL. IV
ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS,
JERUSALEM: 401 P. (TRANS FROM RUSSIAN)

REFERENCE #: 191
NICHOLS,J.T.
1943
THE FRESHWATER FISHES OF CHINA
THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK,
NY: 322 P.

REFERENCE #: 192
JHINGRAN,V.G.
1975
FISH AND FISHERIES OF INDIA
HINDUSTAN PUBL. CORP., DELHI, INDIA: 954 P.

REFERENCE #: 193
TRAUTMAN,M.B.
1981
THE FISHES OF OHIO
OHIO STATE UNIVERSITY PRESS, COLUMBUS, OH: 782 P.

REFERENCE #: 194
JAYARAM,K.C.
1981
THE FRESHWATER FISHES OF INDIA, PAKISTAN,
BENGLADESH, BURMA AND SRI LANKA
ZOOLOGICAL SURVEY OF INDIA, CALCUTTA, INDIA: 475 P.

REFERENCE #: 195
GOZMANY,L.
1979
VOCABULARIUM NOMINUM ANIMALIUM EUROPAE SEPTEM
LINGUIS REDACTUM
AKADEMIAI KIADO, BUDAPEST, HUNGARY: 1171 P.

REFERENCE #: 196
ILLIES,J.
1967
LIMNOFAUNA EUROPAEA
G. F. VERLAG, STUTTGART, GERMANY: 474 P.

REFERENCE #: 197
BALON,E.K. AND A.G.COCHE
1974
LAKE KARIBA: A MAN-MADE TROPICAL ECOSYSTEM IN CENTRAL AFRICA
DR. W. JUNK PUBL., THE HAGUE, NETHERLANDS: 767 P.

REFERENCE #: 198
HUTCHINSON,G.E.
1967
A TREATISE ON LIMNOLOGY, VOL. II
JOHN WILEY AND SONS INC., NEW YORK, NY: 1115 P.

REFERENCE #: 199
MILLOTT,N.
1967
ECHINODERM BIOLOGY
ACADEMIC PRESS INC. (LONDON) LTD., LONDON, ENGLAND: 240 P.

REFERENCE #: 200
MARSHALL,T.C.
1965
FISHES OF THE GREAT BARRIER REEF AND COASTAL WATERS OF QUEENSLAND
LIVINGSTON PUBL. CO., NARBERTH, PA: 566 P.

REFERENCE #: 201
NIKOL'SKII,A.M.
1962
FAUNA OF RUSSIA AND ADJACENT COUNTRIES-AMPHIBIANS
ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS, JERUSALEM: 225 P. (TRANS FROM RUSSIAN)

REFERENCE #: 202
HUBER-PESTALOZZI,G.
1962
DAS PHYTOPLANKTON DES SUSSWASSERS, SYSTEMATIC UND BIOLOGIE
E. SCHWEIZERBART'SCHE VERLAGSBUCHHANDLUNG, STUTTGART, GERMANY: 365 P. (VOL. 2 PART 1), 322 P. (VOL. 3, PUBL. 1968)

REFERENCE #: 203
BARNES,R.D.
1974
INVERTEBRATE ZOOLOGY
3RD EDITION, W.B.SAUNDERS CO., PHILADELPHIA, PA: 870 P.

REFERENCE #: 204
YOUNG,F.N.
1954
THE WATER BEETLES OF FLORIDA
UNIVERSITY OF FLORIDA PRESS, GAINESVILLE, FL:
238 P.

REFERENCE #: 205
ROSS,H.H.
1944
THE CADDIS FLIES, OR TRICHOPTERA, OF ILLINOIS
BULL. OF THE ILL. NAT. HIST. SURV. 23 (1):326 P.

REFERENCE #: 206
RYLOV,V.M.
1963
FAUNA OF U.S.S.R. CRUSTACEA. VOL. III, NO. 3
FRESHWATER CYCLOPOIDA
ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS,
JERUSALEM: 314 P. (TRANS FROM RUSSIAN)

REFERENCE #: 207
WATERMAN,T.H.
1960
THE PHYSIOLOGY OF CRUSTACEA
ACADEMIC PRESS, NEW YORK, NY: 670 P. (VOL. 1),
681 P. (VOL. 2)

REFERENCE #: 208
FARRIS,R.A.
1977
THREE NEW SPECIES OF GNATHOSTOMULIDA FROM THE WEST
ATLANTIC
INT. REVUE GES. HYDROBIOL. 62(6):765-796

REFERENCE #: 209
CREEZEE,M.
1976
SOLENOFILOMORPHIDAE, MAJOR COMPONENT OF A NEW
TURBELLARIAN ASSOCIATION IN THE SULFIDE SYSTEM
INT. REVUE GES. HYDROBIOL. 61(1):105-129

REFERENCE #: 210
TOKIOKA,T.
1967
PACIFIC TUNICATA OF THE U.S. NATIONAL MUSEUM
BULL. U.S. NAT. MUS. 251: 247 P.

REFERENCE #: 211
MILL,P.J. (ED.)
1978
PHYSIOLOGY OF ANNELIDS
ACADEMIC PRESS INC. LTD., LONDON, ENGLAND: 683 P.

REFERENCE #: 212
DARSIE,R.F.JR. AND R.A.WARD
1981
IDENTIFICATION AND GEOGRAPHICAL DISTRIBUTION OF THE
MOSQUITOS OF NORTH AMERICA NORTH OF MEXICO
MOSQUITO SYSTEMATICS, SUPPL. 1:1-313

REFERENCE #: 213
MEDLER,J.T.
1980
INSECTS OF NIGERIA-CHECKLIST AND BIBLIOGRAPHY
MEM. AM. ENT. INST. 30: 919 P.

REFERENCE #: 214
MISRA,K.S.
1969
THE FAUNA OF INDIA AND THE ADJACENT COUNTRIES
MANAGER OF PUBLICATIONS, GOVT. OF INDIA PRESS,
FARIDABAD, INDIA: 276 P. (VOL. 1), 367 P. (VOL. 3,
PUBL. IN 1976)

REFERENCE #: 215
MOORE,J.A.
1961
THE FROGS OF EASTERN NEW SOUTH WALES
BULL. AM. MUS. NAT. HIST. 121(3):149-386

REFERENCE #: 216
LOFTS,B. (ED.)
1974
PHYSIOLOGY OF THE AMPHIBIA. VOL. II.
ACADEMIC PRESS, NEW YORK: 592 P.

REFERENCE #: 217
CHINA,W.E. (ED.)
1966
OFFICIAL LIST OF SPECIFIC NAMES IN ZOOLOGY
INT. COMMISSION ON ZOOLOGICAL NOMENCLATURE, LONDON,
ENGLAND: 286 P.

REFERENCE #: 218
HOBBS,H.H.JR.
1974
A CHECKLIST OF THE NORTH AND MIDDLE AMERICAN CRAYFISHES (DECAPODA: ASTACIDAE AND CAMBARIDAE)
SMITHSONIAN CONTR. ZOOL. 166: 161 P.

REFERENCE #: 219
TODD,E.L. AND R.W.POOLE
1980
KEYS AND ILLUSTRATIONS OF ARMYWORM MOTHS OF THE NOCTURID GENUS SPODOPTERA FROM THE WESTERN HEMISPHERE
ANNALS ENT. SOC. AM. 73(6):722-738

REFERENCE #: 220
HOPPER,B.E.
1963
MARINE NEMATODES FROM THE COASTLINE OF THE GULF OF MEXICO
CAN. J. ZOOL. 41:841-863

REFERENCE #: 221
HOPPER,B.E. AND R.C.CEFALU
1973
FREE-LIVING MARINE NEMATODES FROM BISCAYNE BAY, FLORIDA. NO. 5
TRANS. AM. MICR. SOC. 92(4):578-591

REFERENCE #: 222
HOPPER,B.E.
1969
MARINE NEMATODES OF CANADA. NO. 2
CAN. J. ZOOL. 47:671-690

REFERENCE #: 223
KORRINGA,P.
1976
FARMING THE FLAT OYSTERS OF THE GENUS OSTREA
ELSEVIER SCI. PUBL. CO., AMSTERDAM, NETHERLANDS: 238 P.

REFERENCE #: 224
RAGHUNATHA RAO,T.K.
1981
ECOLOGY OF THE POPULATION OF SOME SPECIES OF AQUATIC HEMIPTERA
PROC. SYMP. ECOL. ANIM. POPUL. ZOOL. SURV. INDIA PART 2:91-94

ATTACHMENT G

SAMPLE DATA CODING FORM

ERL-D 6/

CHEMICAL NAME Example CHEMICAL ABSTRACT REGISTRY NUMBER (CAS#) XXXXX

REFERENCE NUMBER 1230 REVIEWER Anyone DATE mo/day/yr [✓ FW] SW [✓ LAB] FIELD

TEST CHEMICAL	TEST ORGANISM	END EFFECT					TEST CONDITIONS				MEAN (RANGE)								
Purity/Grade ⓐ	Latin and Common Species Name	Contr. ⓑ	Eff. Endpt ⓒ	Effect d	Conc. ug/ℓ (95%CI) ⓔ	BCF	Exposure Time ⓕ	Life-stage age/wt	Exp. Type ⓖ	Concn. M or U ⓗ	Temp °C	Hard. mg/ℓ $CaCO_3$	Alk. mg/ℓ $CaCO_3$	D.O. mg/ℓ or % sat.	pH	Rev. Code ⓘ	Other Chem? Yes/No ⓙ	Other Water Chem Yes/No ⓚ	Other Effects Yes/No ⓛ
98 % AI	Daphnia magna 5	S/	LC50	NA	1000	NA	48h	< 24h	S	U	19	NR	NR	7.0	7.1	2	N	N	N
Remarks:	b/ < 10% mort//																		
"	Salmo gairdneri 4	"	NA	GRO/	10000/	NA	7d	fingerling	F	"	12	"	"	7.2	7.3	2	"	"	"
Remarks:	b/ < 10 % mort//		d/growth NS from control//					e/ highest conc tested//				/aeration, fed//							
"	Benthic invertebrates - 488	U/	"	DRF/	100/	NA	96h	NR	F	"	19	"	"	NR	NR		"	"	"
Remarks:	b/ no control used//		d/ inc drift//					e/ lowest conc tested//				/used artificial stream//							
"	Scenedesmus obliquus 11	S/	"	CLR/	100/	NA	4d	10E+6 initial cell no.	S	"	21	"	"	"	7.4	2	"	"	"
Remarks:	/9200* lux, 12 h photoperiod// b/chlorophyll level graphed//		d/32 % dec chlorophyll content//					e/ "											
"	Salvelinus namaycush 82	I	NA	BCF	89/	0.1	10d	adult	F	M/	12	"	"	7.3	NR	2	"	"	"
Remarks:			e/ "					h/nominal conc = 100 ug/l//											

Reproduced from best available copy.

ATTACHMENT H

GRADE/PURITY ABBREVIATIONS

A - Analytical Grade
AAPS - Atomic Absorption Primary Standard
ACS - American Chemical Society Grade
AE - Acid Equivalent
AI - Active Ingredient
An - Analar Grade
AQ - Aqueous Solution
AR - A.R. Grade
ARST - Analytical Reference Standard
AS - Aqueous Suspension
ASG - Agricultural Supply Grade
B - Biological Grade
C - Commercial Grade
CO - Concentrate
CP - Chemically Pure
CRP - Chromatographically Pure
CRI - Chromatographically Impure
CRY - Crystal
D - Dust
DC - Detached Crystals
DP - Dispersable Powder
E - Emulsion
EM - Eastman Grade
EC - Emulsifiable Concentrate
ES - Emulsifiable Solution, Agent
F - Field Grade
FCAAS - Fisher Certified Atomic Absorption Standards
FO - Formulated
FFO - Field Formulated
G - Granule
GAS CR STD - Gas Chromatograph Standards
GS - Gaseous
HG - Heavy Granular
I - Industrial
L - Laboratory Grade
LD - Liquid
ME - Monsanto Electrical Grade
ND - Neutralized, Desensitized
NF - Nonionized Form
ODA - Organic Dispersal Agent
P - Practical Grade
PA - Pro Analysi Quality
PAN - Pestanal Grade
PAR - Particulate
PEL - Pellet
PF - Purified

Attachment H (continued)

PH - Pharmaceutical Grade
PO - Powder
PR - Production Grade
PRE - Prepared
PST - Pesticide Grade
PU - Pure
R - Reagent Grade
RC - Recrystallized
RE - Research Grade
RF - Registered Formulation
RST - Reference Standard
S - Spectrophotometric Grade
SC - Scintillation Grade
SP - Soluble Powder
SPL - Spray Liquid
SPO - Spray Powder
ST - Standard
T - Technical Grade
TA - Technical Acid Grade
TR - Transformer Grade
U - Univar Grade
UD - Unneutralized, Desensitized
USP - United States Pharmacopeia
WP - Wettable Powder
WS - Water Soluble
WHO - World Health Organization

ATTACHMENT I

EFFECT ENDPOINT ABBREVIATIONS

The effect endpoints have been recorded as given by the authors.

LC0 - No Mortality Concentration
LC25 - Lethal Concentration to 25% of Tested Organisms
LC50 - Median Lethal Concentration
LC90 - Lethal Concentration to 90% of Tested Organisms
LC99 - Lethal Concentration to 99% of Tested Organisms
LC100 - Lethal Concentration
LD50 - Median Lethal Concentration When Exposed Through Injection or Diet
LD100 - Lethal Concentration Exposed Through Injection
EC20 - Effective Concentration to 20% of Tested Organisms
EC50 - Median Effective Concentration
LT50 - Lethal Threshold Concentration
LT50* - Mean Survival Time
ET50 - Median Estimated Survival Time
EC50-AB - Abnormalities
EC50-AC - AChE Activity
EC50-AV - Avoidance
EC50-BA - Byssal Attachment
EC50-BH - Behavior
EC50-BM - Biomass
EC50-CC - Color Change
EC50-CD - Cell Division
EC50-CF - Cough Frequency
EC50-CH - Chlorophyll
EC50-CL - Case Leaving
EC50-DE - Detection of Toxicant
EC50-DT - Detachment
EC50-DV - Development
EC50-EM - Emergence
EC50-EP - Egg Production
EC50-EQ - Loss of Equilibrium
EC50-EZ - Enzyme Activity
EC50-FC - Food Consumption
EC50-FD - Reduced First Feeding Incidence
EC50-FF - Critical Flicker Rate
EC50-FL - Fluorescence
EC50-FP - Fecal Pellets
EC50-FR - Filtration Rate
EC50-GR - Growth
EC50-HA - Hatchability
EC50-HM - Hemmorhage
EC50-IM - Immobilization
EC50-IN - Inhibition
EC50-IR - Irritation

Attachment I (Continued)

EC50-MI - Migration Suppression
EC50-OX - Oxygen Production
EC50-PC - Population Carrying Capacity
EC50-PG - Pigment Change
EC50-PH - Physiological Effect
EC50-PP - Population Size Reduction
EC50-PS - Photosynthesis Effect
EC50-PU - Pupation
EC50-RE - Reproduction
EC50-RG - Regeneration
EC50-RR - Respiratory Rate
EC50-SC - Shell Valve Closure
EC50-SW - Swimming
EC50-TE - Teratogenesis
EC50-UP - Uptake
EC50-VD - Vertebral Damage

ATTACHMENT J

EFFECT ABBREVIATIONS

The effect abbreviations used by the authors have been grouped in the following manner in order to facilitate sorting and analysis of the data. More specific terminology for the effect may be found in the Remarks section of each individual data entry. Definitions and examples of the effects, as used in AQUIRE, follow this listing.

ABD - Abundance
ABN - Abnormalities
AVO - Avoidance
BCF - Bioconcentration Factor
BCFC - Bioconcentration Factor Where Clearance is Recorded in Remarks
BCFD - BCF Was Calculated Using a Dry Weight Tissue Concentration
BEH - Behavior
BIO - Biochemical Effect
BMS - Biomass
BSA - Byssal Attachment
CEL - Cellular Effect
CIL - Ciliary Activity
CLN - Rate of Colonization
CLR - Chlorophyll
CYT - Cytogenetic Effect
DRF - Drift
DVP - Development
ENZ - Enzyme Effect
EQU - Equilibrium
FCR - Food Consumption
FLT - Filtration Rate
GRO - Growth
HAT - Hatchability
HEM - Hematological Effect
HIS - Histological Effect
HPS - Hepatosomatic Index
HRM - Hormone Levels Affected
LET - Lethal
LOC - Locomotor Behavior
MOR - Mortality
MOT - Motility
NFX - Nitrogen Fixation
OC - Oxygen Consumption
PGR - Population Growth
PHY - Physiological Effect
POP - Population
PR - Phototactic Response
PRB - Predatory Behavior
PRV - Predation Vulnerability
PSE - Photosynthesis Effect
REP - Reproduction
RES - Respiratory Rate
RGN - Regeneration
RSD - Residue
STR - Stress
TER - Teratogenesis
THL - Thermal Effect
TMR - Tumor Occurrence
VTE - Vertebral Effect

Attachment J (Continued)

Definitions and Examples

ABD - Abundance. Number of organisms within the same species changes.

ABN - Abnormalities. Physical malformation during developmental stages (embryo through larvae) caused by toxicant.

AVO - Avoidance. Organism avoids or is attracted to a chemical gradient.

BCF - Bioconcentration factor. Accumulation of a toxicant in the tissues of the test organism compared to the measured toxicant concentration in the water in which the organism was exposed;

$$\text{e.g., BCF} = \frac{\mu g/g\ \text{Cu in fish tissue}}{\mu g/L\ \text{Cu in } H_2O}.$$

BCFC - Bioconcentration factor where clearance is recorded in Remarks.

BCFD - Bioconcentration factor calculated using a dry weight tissue concentration.

BEH - Behavior. Quantifiable change in activity (may be trained behavior) in reaction to the test chemical; e.g., preferred temperature, shell valve closure.

BIO - Biochemical effect. Change in physiochemical process(es); e.g., glycogen uptake, phosphorus uptake.

BSA - Byssal attachment. Change in ability of certain molluscs to attach themselves to rocks by a collection of silky filaments caused by toxicant.

CEL - Cellular effect. Change in organelle structure; e.g., mitochondria, cell walls.

CLN - Rate of colonization. Change in ability of organisms to colonize an uninhibited substrate under toxicant stress.

CLR - Chlorophyll. Measurable change in chlorophyll content in reaction to toxicant; e.g., chlorophyll a content, chlorosis, change in algal cell pigment.

CYT - Cytogenetic effect. Genetic mutation on a cellular level. RNA and DNA discussed.

Attachment J (Continued)

D-(MOR, GRO, DVP...) - Delayed effect. Effect is seen after a given time period in recovery water; e.g., DMOR/, Remarks: EFCT/40 % mort after 48 h observation in recovery water //.

DRF - Drift. Change in number of larval aquatic insects to travel a given distance in a stream in response to a chemical application.

DVP - Development. 1) Change in ability to grow to a more mature life-stage. 2) Change in time between separate life-stages, e.g., megalopa to 1st crab, 1st crab to 2nd crab. Also includes metamorphosis, molting, emergence and yolk absorption effects.

ENZ - Enzyme effect. Change in enzyme activity caused by toxicant, including ATP and AChE activities.

EQU - Equilibrium. Loss of balance in response to toxicant.

FCR - Food consumption rate. Quantifiable change in rate of ingestion or fecal pellet production in response to toxicant.

FLT - Filtration rate. Change in rate of filtration in response to toxicant; e.g., molluscs, crustaceans.

GRO - Growth. Measurable change in length and/or weight of test organism during chronic exposure to toxicant.

HAT - Hatchability. Change in % hatch or time to hatch.

HEM - Hematological effect. Change in various blood parameters; e.g., red blood cell count, hematocrit, due to toxicant exposure, including effects on serum osmolarity.

HIS - Histological effect. Presence of physical damage to tissues in the test organism caused by toxicant.

HPS - Hepatosomatic index. Change in hepatosomatic index in response to a toxicant.

HRM - Hormone level. Change in hormone concentration in response to toxicant exposure.

LET - Lethal. Effect expressed as 100% mortality or 0% survival including algicidal and herbicidal effects.

Attachment J (Continued)

LOC - Locomotor behavior. Quantifiable change in direct movement or activity; e.g., swimming speed, endurance, ability to resurface after submersion.

MOR - Mortality. Effect expressed as % death or % survival or as general remarks in comparison to control; e.g., decreased mortality, no significant mortality, toxic. Herbicidal and algistatic effects are included.

MOT - Motility. Change in ability to move in response to toxicant; i.e., immobilization.

NFX - Nitrogen fixation. Change in ability of an algal culture to fix nitrogen due to toxicant.

OC - Oxygen consumption. Quantifiable change in oxygen uptake of test animal or its tissues in response to toxicant measured in terms of ml O_2/h/g wt. OC does not include oxygen uptake for plants (see PSE).

PGR - Population growth. Change in cell number (algal species) in response to chemical; includes pre-exponential lag rate effects.

PHY - Physiological effects. Changes in the organic processes or functions of an organism or any of its parts caused by toxicant. Effects include metabolic stress, cholesterol, lipid, caloric content, membrane permeability, osmoregulation, cough frequency, animal pigment changes, urine production, chemosensory response, heart beat, structural changes, and neurological effects among others.

POP - Population. Change in number of species in a given population; i.e., species diversity.

PR - Phototactic response. Attraction to or avoidance of light in response to chemical.

PRB - Predatory behavior. Change in ability and inclination to seek and capture prey in response to chemical.

PRV - Predation vulnerability. Change in ability to avoid or escape capture by predator.

PSE - Photosynthesis effect. Change in plant productivity indicated by change in C14 or CO_2 uptake or change in respiration.

REP - Reproduction effects. Change in male and/or female ability to reproduce caused by toxicant. Effect is indicated by number of young per female, time to spawn, egg production, broods per female, fertilization.

RES - Respiration effect. Change in ventilatory rate or breathing activity of the test organism in response to toxicant; i.e., opercular movement.

RGN - Regeneration. Change in ability to regenerate a body part; i.e., leg, tail (in species with regeneration capabilities), due to toxicant.

RSD - Residue. Accumulation or uptake of a chemical in the tissues of the test organism at an unmeasured chemical concentration in the water.

STR - Stress. Observed physiological tension in animals or plants caused by the presence of chemical.

TER - Teratogenesis. Quantifiable occurrence of abnormal offspring due to presence of chemical.

THL - Thermal effect. Change in tolerance to temperature change in presence of the test chemical.

TMR - Tumor occurrence. Presence of a mass of abnormal tissue after exposure to toxicant; i.e., carcinogenic effects.

VTE - Vertebral effect. Physical change in vertebral structure and/or composition due to toxicant exposure; e.g., scoliosis, lordosis, bone composition.

ATTACHMENT K

CONCENTRATION CALCULATIONS

Formula	Name	Recalculate and Report As
$(NH_4)_2HPO_4$	Ammonium hydrogen phosphate	N
NH_4OH[a/]	Ammonium hydroxide	N
$(NH_4)_2SO_4$	Ammonium sulfate	N
$CaAsHO_3$	Calcium arsenite	AsO_2^-
$CaCl_2$	Calcium chloride	Ca and Cl
$Ca(NO_3)_2$	Calcium nitrate	Ca and N
$CaSO_4$	Calcium sulfate	Ca and S
ClO_3^-	Chlorate	Cl
$CrCl_3$	Chromic chloride, Chromium(III) chloride	Cr(III)
$Cu(C_2H_3O_2)_2$	Cupric acetate, Copper(II) acetate	Cu(II)
$2((CH_3)_2)PbCl_2$	Diethyl lead dichloride	Pb
$(CH_3)_2PbCl_2$	Dimethyl lead dichloride	Pb
HCl[a/]	Hydrochloric acid	Cl
HCN	Hydrogen cyanide	CN
$HgCl_2$	Mercuric chloride, Mercury(II) chloride	Hg(II)
CH_3Hg^{2+}	Methyl mercury(II)	Hg(II)
HNO_3[a/]	Nitric acid	N
$C_6H_5HgC_2H_3O_2$	Phenyl mercuric acetate	Hg(II)
H_3PO_4[a/]	Phosphoric acid	P
KCl	Potassium chloride	K and Cl
K_2CrO_4	Potassium chromate	Cr(VI)
KCN	Potassium cyanide	CN

ATTACHMENT K (continued)

Formula	Name	Recalculate and Report As
$K_2Cr_2O_7$	Potassium dichromate	Cr(VI)
KOH[a]	Potassium hydroxide	K
KNO_3	Potassium nitrate	K and N
$KMnO_4$	Potassium permanganate	Mn(VII)
KIO_4	Potassium periodate	I
K_2SO_4	Potassium sulfate	K and S
NaCl	Sodium chloride	Na and Cl
$NaOH$[a]	Sodium hydroxide	Na
NaClO	Sodium hypochlorite	Cl_2
$NaNO_3$	Sodium nitrate	Na and N
Na_2SO_4	Sodium sulfate	Na and S
Na_2S	Sodium sulfide	H_2S
$Na_2S_2O_3$	Sodium thiosulfate	S
H_2SO_4[a]	Sulfuric acid	S
$Pb(C_2H_5)_4$	Tetraethyl lead	Pb
$Sn(C_2H_5)_4$	Tetraethyl tin	Sn
$Pb(CH_3)_4$	Tetramethyl lead	Pb
$Sn(CH_3)_4$	Tetramethyl tin	Sn
$Pb(C_6H_5)_4$	Tetraphenyl lead	Pb
$Sn(C_6H_5)_4$	Tetraphenyl tin	Sn
CH_3CSNH_2	Thioacetamide	H_2S
$(C_4H_9)_3Sn(OOCH_3)$	Tributyl tin acetate	Sn
$(C_2H_5)_3PbCl$	Triethyl lead chloride	Pb
$(C_2H_5)_3SnCl$	Triethyl tin chloride	Sn

ATTACHMENT K (continued)

Formula	Name	Recalculate and Report As
$(C_2H_5)_3SnOH$[a/]	Triethyl tin hydroxide	Sn
$(CH_3)_3PbCl$	Trimethyl lead chloride	Pb
$(CH_3)_3SnOH$[a/]	Trimethyl tin hydroxide	Sn
$(C_6H_5)_3PbCl$	Triphenyl lead chloride	Pb
$(C_6H_5)_3SnCl$	Triphenyl tin chloride	Sn
$(C_6H_5)_3SnOH$[a/]	Triphenyl tin hydroxide	Sn
$(C_3H_7)_3SnCl$	Tripropyl tin chloride	Sn
$(C_3H_7)_3SnOH$[a/]	Tripropyl tin hydroxide	Sn

Notes:

(a) For acids and bases:

If test water pH is NR, see data base coordinator.

If test water pH is 6.5-9.0, okay to enter.

If dilution water pH only is reported, check paper.

If test water pH is less than 6.5 or greater than 9.0, see data base coordinator.

Don't enter if test and dilution water pH are NR.

(b) For the salts of Cl^-, SO_4^{2-}, NO_3^-, $C_2H_3O_2^-$ always use the metal ion or N for ammonia. However, if those salts have cations Na, K, Ca, Mg, Rb then calculate as both cation and anion.

ATTACHMENT K (continued)

(c) For the following anions, report only if the cation is Na, K, Ca, Mg, or Rb:

sulfite (as S)
nitrite (as N)
bisulfite (as S)
bisulfide, HS^- (as H_2S)

(d) When making calculations refer to the significant figure conventions outlined in Attachment S.

For those chemicals having more than one component considered to be toxic, these are categorized as "Joint Toxicity" and are not entered into AQUIRE. Examples:

- Ammonium arsenate
- Ammonium ferricyanate
- Ammonium ferricyanide
- Ammonium fluoride
- Ammonium fluoroborate
- Ammonium molybdate
- Ammonium metavanadate
- Ammonium picrate
- Ammonium sulfamate
- Ammonium sulfide
- Ammonium sulfite
- Ammonium sulfocyanate
- Ammonium silicofluoride
- Ammonium thiocyanate
- Arsenic trisulfide
- Cobaltous bromide
- Copper ammoniate
- Copper ammonium chloride
- Lead fluoroborate
- Mercuric fluoride
- Mercuric thiocyanate
- Nickel(II) selenate
- Nickel(II) tungstate
- Pentachlorophenol-Cu
- Phospho-gypsum
- Tributyl tin fluoride

ATTACHMENT L

CONVERSION FACTORS

1. All concentrations recorded in the concentration field should be expressed in µg/L.

$$\text{ppm} = \frac{\text{mg}}{\text{L}} \times \frac{1000\ \mu\text{g}}{1\ \text{mg}} = 1000\ \mu\text{g/L}$$

$$\text{ppb} = \mu\text{g/L}$$

$$\mu\text{g/dm}^3 = \mu\text{g/L}$$

2. 1 mole = 1 gram-molecular-weight of a compound

$$\text{M} = \text{Molarity} = \frac{\text{moles solute}}{\text{liters solution}}$$

Example:

$$0.001\text{M NaCl} = \frac{0.001\ \text{mole NaCl}}{1\ \text{L}} \times \frac{\text{m.wt. NaCl (g)}}{\text{mole}} \times \frac{1{,}000{,}000\ \mu\text{g}}{1\ \text{g}}$$

$$= \frac{0.001\ (23 + 35.5) \times 1{,}000{,}000\ \mu\text{g}}{1\ \text{L}}$$

$$= 58{,}500\ \mu\text{g/L NaCl}$$

3. In some specific cases, the concentration must be reported as some component of the test chemical; e.g., for cadmium chloride, if the author expressed concentration as µg/L $CdCl_2$, recalculate to express as µg/L Cd.

Multiply the expressed value by the ratio of the formula weight (F.W.) of the desired form over the formula weight of the expressed form:

$$\text{Concentration as expressed form} \times \frac{\text{F.W. of desired form}}{\text{F.W. of expressed form}} = \text{Concentration as desired form}$$

Example:

To convert 1 mg/L $CdCl_2$ to µg/1 Cd^{2+}:

$$1\ \frac{mg}{L}\ CdCl_2 \times \frac{1000\ \mu g}{mg} \times \frac{F.W.\ Cd}{F.W.\ CdCl_2}$$

$$= 1\ \frac{mg}{L}\ CdCl_2 \times \frac{1000\ \mu g}{mg} \times \frac{112.4\ g}{112.4 + 2(35.5)\ g}$$

$$= 612.9\ \mu g/L\ Cd^{2+}$$

If 2 or more atoms of metal are present in the salt, then the formula weight of the metal must be multiplied by the number of atoms.

4. If concentrations are reported in vol/vol units, obtain the density of the chemical and multiply the density as follows:

$$\text{conc in } \frac{\mu L}{L} \times \text{ density in } \frac{g}{ml} \times 1000 = \frac{\mu g}{L}$$

$$\text{conc in } \frac{ml}{L} \times \text{ density in } \frac{g}{ml} \times 1{,}000{,}000 = \frac{\mu g}{L}$$

If the density cannot be obtained, write in the author's vol/vol units after the concentration number in the concentration field.

5. All temperatures should be expressed in °C. See below for Fahrenheit-Celsius conversion table.

Temp. in °C = (0.056)(Temp. in °F -32)

Temp. in °C = °Kelvin + 273.15°C

6. Alkalinity and hardness should be expressed as mg/L $CaCO_3$.

Alkalinity: 1 meq/L $CaCO_3$ = 50 mg/L $CaCO_3$

Hardness: 1 meq/L $CaCO_3$ = 50 mg/L $CaCO_3$

Hardness: dH or °d = German degree or grade of hardness

dH or °d x 17.9 = mg/L as $CaCO_3$

7. Other Units

inches x 2.54 = cm
feet x 0.305 = m
feet^2 x 0.09 = m^2
1 ha = 10,000 m^2

acre x 0.405 = ha
acre x 4047 = m^2
acre feet x 1234 = m^3

lb x 0.454 = kg
lb/acre x 1.12 = kg/ha
kg/acre x 2.47 = kg/ha

grains x 1.43 x 10^{-4} = lb
grains/gallon x 17.1 = mg/L
gallons x 3.785 = liters

footcandle x 10.76 = lux
lumen/m^2 = lux

8. Temperature Conversions: Fahrenheit/Celsius

Formulas: F to C: (°F - 32) x 5/9 = °C
C to F: (°C x 9/5) + 32 = °F

ATTACHMENT M

LIST OF ATOMIC WEIGHTS

Name	Symbol	At. No.	At. Wt.
Actinium	Ac	89	227
Aluminum	Al	13	26.9815
Americium	Am	95	243
Antimony	Sb	51	121.75
Argon	Ar	18	39.948
Arsenic	As	33	74.9216
Astatine	At	85	210
Barium	Ba	56	137.34
Berkelium	Bk	97	245
Beryllium	Be	4	9.0122
Bismuth	Bi	83	208.980
Boron	B	5	10.811
Bromine	Br	35	79.909
Cadmium	Cd	48	112.40
Calcium	Ca	20	40.08
Californium	Cf	98	248
Carbon	C	6	12.01115
Cerium	Ce	58	140.12
Cesium	Cs	55	132.905
Chlorine	Cl	17	35.453
Chromium	Cr	24	51.996
Cobalt	Co	27	58.9332
Copper	Cu	29	63.54
Curium	Cm	96	245
Dysprosium	Dy	66	162.50
Einsteinium	Es	99	247
Erbium	Er	68	167.26
Europium	Eu	63	151.96
Fermium	Fm	100	254
Fluorine	F	9	18.9984
Francium	Fr	87	223
Gadolinium	Gd	64	157.25
Gallium	Ga	31	69.72
Germanium	Ge	32	72.59
Gold	Au	79	196.967
Hafnium	Hf	72	178.49
Helium	He	2	4.0026
Holmium	Ho	67	164.930
Hydrogen	H	1	1.00797
Indium	In	49	114.82
Iodine	I	53	126.9044
Iridium	Ir	77	192.2
Iron	Fe	26	55.847
Krypton	Kr	36	83.80
Lanthanum	La	57	138.91
Lawrencium	Lw	103	259
Lead	Pb	82	207.19
Lithium	Li	3	6.939
Lutetium	Lu	71	174.97
Magnesium	Mg	12	24.312
Manganese	Mn	25	54.9381
Mendelenium	Md	101	256
Mercury	Hg	80	200.59
Molybdenum	Mo	42	95.94
Neodymium	Nd	60	144.24
Neon	Ne	10	20.183
Neptunium	Np	93	237
Nickel	Ni	28	58.71
Niobium	Nb	41	92.906
Nitrogen	N	7	14.0067
Nobelium	No	102	253
Osmium	Os	76	190.2
Oxygen	O	8	15.9994
Palladium	Pd	46	105.4
Phosphorus	P	15	30.9738
Platinum	Pt	78	195.09
Plutonium	Pu	94	242
Polonium	Po	84	210
Potassium	K	19	39.102
Praseodymium	Pr	59	140.907
Promethium	Pm	61	145
Protactinium	Pa	91	231
Radium	Ra	88	226
Radon	Rn	86	222
Rhenium	Re	75	186.2
Rhodium	Rh	45	102.905
Rubidium	Rb	37	85.47
Ruthenium	Ru	44	101.07
Samarium	Sm	62	150.35
Scandium	Sc	21	44.956
Selenium	Se	34	78.96
Silicon	Si	14	28.086
Silver	Ag	47	107.870
Sodium	Na	11	22.9898
Strontium	Sr	38	87.62
Sulfur	S	16	32.064
Tantalum	Ta	23	180.948
Technetium	Tc	43	99
Tellurium	Te	52	127.60
Terbium	Tb	65	158.924
Thallium	Tl	81	204.37
Thorium	Th	90	232.038
Thulium	Tm	69	168.934
Tin	Sn	50	118.69
Titanium	Ti	22	47.90
Tungsten	W	74	183.85
Uranium	U	92	238.03
Vanadium	V	23	50.942
Xenon	Xe	54	131.30
Ytterbium	Yb	70	173.04
Yttrium	Y	39	88.905
Zinc	Zn	30	65.37
Zirconium	Zr	40	91.22

ATTACHMENT N

CONCENTRATION CODES

T - Total
U - Un-ionized
A - Active ingredient
F - Formulation
D - Dissolved

ATTACHMENT O

EXPOSURE TYPE ABBREVIATIONS

D - Diet
F - Flow-Through
I - Injection
*L - Field System
S - Static
R - Renewal
*T - In Situ
V - In Vitro

---

* - see Notes on Reviewing Field Papers, pages 36-39

ATTACHMENT P

QUALITY REVIEW CODE CONSIDERATIONS FOR LABORATORY TESTS

Organisms: All organisms used in a test should come from the same source and should be the same species (free of hybrids).

All organisms in a test should be approximately the same size and age.

The organisms should be acclimated to test conditions prior to introduction of toxicant.

Organisms should be handled as little as possible.

Organisms should not be fed during acute tests.

Organisms should not be used if they are diseased or if more than three percent die during the 48 hours preceding the test.

Organisms should not be used for at least 10 days after they have been treated for disease.

There should be at least five organisms per test concentration, preferably 10 or more.

Organisms should have been cultured at appropriate temperatures and salinity for the species.

Test Design: All tests should have a control treatment consisting of the same dilution water and identical conditions as in the other treatments, except for the toxicant.

If a carrier solvent is used in the exposure chambers, then there should be a solvent in the control chambers and also a solvent-free control.

Control mortality should be 10 percent or less in acute tests.

There should be at least three exposure concentrations, preferably five or more.

Dissolved oxygen should be between 60 percent and 100 percent of saturation.

Tests should not be conducted in distilled water, chlorinated water, or rain water.

For static tests, the organism loading should not exceed 0.8 g/L.

For flow-through tests, the organism loading should not exceed 10 g/L.

The test temperatures should be recorded.

The author should describe the statistical methods used to determine effect endpoints.

The author should describe the water chemistry characteristics of the exposure water.

The toxicant exposure concentrations should be analyzed, and the author should describe the analytical methods used for their determination.

References on Toxicity Test Methods

American Public Health Association et al. 1980. Standard methods for examination of water and waste water. 15th edition, American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington, DC: 1134 p.

American Society for Testing and Materials. 1980. Standard practice for conducting acute toxicity tests with fishes, macroinvertebrates, and amphibians. Pages 1-25. In: Annual Book of ASTM Standards, American Society for Testing and Materials, Philadelphia, PA.

Doudoroff, P., B. G. Anderson, G. E. Burdick, P. S. Galtsoff, W. B. Hart, R. Patrick, E. R. Strong, E. W. Surber, and W. M. Van Horn. 1951. Bio-assay methods for the evaluation of acute toxicity of industrial wastes to fish. Sewage and Industrial Wastes 23(11): 1380-1397.

Sprague, J. B. 1969. Measurement of pollutant toxicity to fish. I. Bioassay methods for acute toxicity. Water Res. 3(11): 793-821.

ATTACHMENT Q

STANDARD ABBREVIATIONS FOR USE IN REMARKS

ACT INGRD	active ingredient
ACTVY	activity
ADJ	adjusted
AGRIC	agricultural
ALD	algicidal
ALG	algistatic
ANT	anterior
APPL	apply (applied)
APPLIC	application
AVG	average
CAR	carcinogenesis
CHEM	chemical
CHG	change
CMPD	compound
CO	county
CONC	concentration
CONT	continue(d)
CULT	culture
D	day
DEC	decrease
DEG	degrees
DESCR	described
DIAM	diameter
DIF	difference (different)
DIST	distilled
DVP	development
ELIM	elimination
EMR	emergence
ENCL	enclosure
EPR	egg production
EQUILIB	equilibrium

ATTACHMENT Q (continued)

STANDARD ABBREVIATIONS FOR USE IN REMARKS

EQUIV	equivalent
EST	estimate(d)
EXP	exposure
EXPO	exponential
EXPT	experiment
FER	fertilizer
FLT	filter, filtering, filtered
FT	feet
G	grams
GAL	gallons
>	greater than
H	hour(s)
HARD	hardness
IMMED	immediate
INC	increase
INCUB	incubate, incubation
INFO	information
INHIB	inhibit
INIT	initial
INJ	injected, injection
INST	institute
INT	interval
IP	intraperitoneal
<	less than
M	meter
MAL	malformation
MAX	maximum
MEAS	measure(d)
MED	medium
MEM	membrane
MEQ	milliequivalent
MET	metamorphosis

ATTACHMENT Q (continued)

STANDARD ABBREVIATIONS FOR USE IN REMAKRS

MIN	minimum

MINUTES are abbreviated as a fraction of the hour

MO	month
MOD	modified
MOL	molting
MORT	mortality
MTS	mountains
N	north
NEF	no effect
NEG	negative
NO.	number
NOM	nominal
NS	not significant
OBSVD	observed
PEL	pre-exponential lag rate
PHOTO	photoperiod
PR	pair
POP	population
POS	positive
POST	posterior
PRECIP	precipitate
PRETRTMT	pretreatment
PRODUC	production
QUANT	quantitative
R	river
REF	reference
REPOP	repopulated
RES	respiration
RESP	respiratory
RPTD	reported
SEC	second
SEDMT	sediment

ATTACHMENT Q (continued)

STANDARD ABBREVIATIONS FOR USE IN REMARKS

SIG	significant
SOLNS	solutions
SOLV	solvent
SPEC	species
STC	structural
STD	standard
STATIS	statistically
SYN	synthesis
TDS	total dissolved solids, total solids, dissolved solids
TOX	toxicant
TOXIC	toxic
TRTMT	treatment
UPTK	uptake
URP	urine production
WK	week
WT	weight
YAB	yolk absorption
YR	year

ATTACHMENT R

SIGNIFICANT FIGURE CONVENTIONS[1]

The number of significant figures in a given number is found by counting the number of figures from left to right in the number beginning with the first nonzero digit and continuing until reaching the digit that contains the uncertainty. Each of the following numbers has three significant figures:

123	123	1 23	123	12 3
454	0.296	7.31	0.00846	10.7

Sometimes zeros at the end of a number present a problem. These zeros can be significant figures or they can be space-fillers used to locate the decimal point. The terminal zero in the number 1520 simply locates the decimal point and is not significant - the uncertainty is ±20, and we say that there are three significant figures. In the number 1.520 there are four significant figures. Check to see that the following numbers contain the indicated number of significant figures.

Sig. Fig.	12	123	12 345	1	123	1234 5
Number	340	700.	10.000	0.000002	0.0402	1062.0

In addition or subtraction, we perform the mathematical operation and round the answer to the digit that has the greatest amount of uncertainty. We can apply this rule simply by drawing a vertical line after the least exact number, performing the addition or subtraction, and rounding our answer so that it "fits" in the space before the vertical line. Confirm for yourself that the following examples are done correctly.

---

[1] Adapted from Bailer, J.C., et al. 1978. Appendix A. Chemical arithmetic. Chemistry. Academic Press, N.Y.: 881-885.

				0.296
	14.	0.0097	0.62	4.41
	-0.072	0.0563	273.	8.9273
	13.928	0.0660	273.62	13.6333
Answer:	14	0.0660	274	13.63

In multiplication or division, we perform the mathematical operation and round the answer to the number of significant figures so that the answer has the same relative error as does the least exact factor.

Usually, the rule above can be applied simply by performing the multiplication or division, counting the number of significant figures in each factor, and rounding the answer to the same number of significant figures as are in the factor with the smallest number of significant figures. Some examples follow:

$$(1.621\text{ moles})(16\text{ g/mole}) = 26\text{ g} \qquad \frac{26.9\text{ g}}{2.69\text{ g/cm}^3} = 10.0\text{ cm}^3$$

A good guide to follow when rounding a 5 is always to round to the nearest even number; in this way, any tendency to round in a set direction is eliminated because there is an equal likelihood that the nearest even number will be the higher or the lower in any given situation. Examples: 1.25 rounds to 1.2; 1.35 rounds to 1.4.